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ABSTRACT

New initiatives have provided educators with exciting resources to develop local, regional, and national infrastructures. Many new public and private sector collaborations have been the result, and this conference explores the implications of these changes for the education profession. The profession has focused on the various ethical issues concerned with the expansion of the Internet, and with questions of ownership of the medium, censorship, and cost of access. As the importance of telecommunications in education gains recognition, it also gains momentum. These proceedings portray the projects, discoveries, experiments, and experiences gained by educators throughout the world. Veronica, Archie, World Wide Web (WWW), file transfer protocol (FTP), wide area information servers (WAIS), Gopher, Mosaic, and many other network searching tools are presented in the workshops and demonstration sessions. Four broad themes are discussed: communication, community, collaboration, and connection. Information is exchanged about new technologies and trends, research issues, and how communications technology can most effectively support educational reform. Two novelties are introduced in this conference: an open channel for juried submissions, resulting in several contributions of academically excellent papers; and a public debate, which closes the conference. (MAS)

PROCEEDINGS

for

Tel•Ed '94

THE THIRD INTERNATIONAL SYMPOSIUM ON TELECOMMUNICATIONS IN EDUCATION

November 10–13, 1994

Albuquerque Convention Center
Albuquerque, New Mexico

Presented by:

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CONFERENCE CO-CHAIR WELCOME

Welcome to Albuquerque, New Mexico and to Tel•Ed '94, the Third International Conference on Telecommunications in Education. ISTE and other conference sponsors are delighted to provide this international forum for you and other leaders in educational telecommunications.

This event brings together representatives from the diverse world of education including: educators from across North America; state departments of education executives; leaders from overseas ministries of education; representatives from state and local governments; representatives from public sector organizations; and a broad cross-section of private sector vendors and service providers.

Since we last met at Tel•Ed '93, new initiatives have provided educators with exciting resources to develop local, regional, and national infrastructures. As a result, many new public and private sector collaborations have been forged. It is a truly rewarding and challenging time to work in educational technology.

But what do these changes mean to our profession and its aims? We meet now to assess new opportunities while exploring four broad themes: communication, community, collaboration, and connection. We will form a temporary network to facilitate the development of the technology and strategy required for implementing the Global and National Information Infrastructure. Our Tel•Ed '94 network will provide:

- A means of exchanging information about new technologies and trends.
- A better understanding of research issues.
- Insights into how communications technologies can most effectively support educational reform.

In formal discussions and casual meetings we will deepen our knowledge of the policies that affect, reshape, and rebuild educational communities. By learning from one another we can reach our shared goals.

We are grateful to the Conference Planning Committee, ISTE, and the conference cosponsors for devoting their extraordinary efforts and contributions to this exciting conference. We hope Tel•Ed '94 will be both productive and enjoyable, and we look forward to meeting you in the next few days.

Kathy Kothmann
Connie Stout

Conference Co-Chairs

PROGRAM CO-CHAIR WELCOME

The proceedings of the Third International Symposium for Telecommunications in Education are the ultimate evidence of the vast scope of presentations offered to the participants of Tel•Ed '94.

Scanning the pages of the paper edition, or browsing through the CD-ROM version of the Tel•Ed '94 proceedings, the reader can fully assess the state of the art of telecommunications in the international education society.

This last year has focused attention on various ethical issues concerned with the expansion of the Internet. The questions of ownership of the medium, censorship, and cost of access are only a that which gained public attention. You will find these in the spotlight of Tel•Ed '94.

As the importance of telecommunications in education gains recognition, it also gains momentum. These proceedings best portray both quantity and quality of projects, discoveries, experiments, and experiences gained by scores of teachers around the globe.

The advance of the technology, as well as the unprecedented amounts of information, prepared the scene for a vast array of tools and methods to scan, surf, ride, mine, and search the "net." Veronica and Archie, WWW, FTP and WAIS, Gopher, Mosaic, and many others are combined in the workshops and demonstration sessions of this conference.

At this symposium we are introducing two novelties. First, a public debate will be the closing spotlight event of the conference. All participants are invited to share their views and opinions on the some of the issues that will shape the tomorrow of telecommunications.

Second, we opened a channel for juried submissions. We feel it is the time for Tel•Ed to recognize papers that are academically excellent. Several contributors found it important to publish their work with us here and make these proceedings and Tel•Ed '94 even more attractive.

Making a "Global Village" come true requires global participation. Tel•Ed '94 emphasized the international scope of our conference. In these proceedings and, moreover, on the presentation podium, we will meet many friends from distant lands.

To those who have traveled from afar and to those who come from nearby we would like to extend a warm welcome to Tel•Ed '94. Use these proceedings to recapture the importance of the contributions made on-site and as reference in your future work.

Betsy Frederick
Gideon Goldstein

Program Co-chairs

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A Focus on Model Support and Training Programs

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Key words: models, networking, support, training, ethics

Abstract

Reaching across the country, schools and districts meet local needs of curriculum integration with electronic networking differently, yet come together for Tel•Ed '94 to sh*are models for professional growth. These communicating educators believe in the mission of the Consortium for School Networking Support and Training Committee and offer stories of training and support efforts which show similar characteristics.*

The enhancement of teaching and learning, administrative support, hands-on experiences, and incentives are basic components of training models in K-12 schools today. University partnerships and other community resources extend training and support opportunities for networking teachers. Developing, communicating, and modeling proactive appropriate use policies for students and teachers also are an integral part of training and support designs.

Software
Using Mosaic to Create Visually Oriented Hypermedia Documents

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Key words: Mosaic, hypertext, telecommunications, visual

Abstract

The movement from print to a digital, highly visually oriented document, such as Mosaic, demands a new look at how to plan and prepare documents for telecommunications. Experience gained in the process of developing Mosaic pages for the Scholastic Internet Center has generated ideas on effective ways to approach such a task. This is especially important when the effort is a collaborative one, rather than an individual project. Initial planning needs to be graphically developed so that the goals and the "vision" are clear from the outset. We found that everyone carries a different "picture" in his or her head which does not necessarily correlate with the "picture" in someone else's mind. Methods were developed for ensuring that the draft ideas were clear for everyone involved in the project. It may also be wise to share background materials before the development team begins its work. For example, a good understanding of hypertext is absolutely necessary to comprehend how one Mosaic page may relate to another and, for those unversed in using Mosaic, how it works. We devised strategies to help everyone "see" the project clearly, and thus enabled many others to add constructively to the project's development. Later we created a locally run Mosaic demo of the Scholastic Internet Center so that we could share our project with others who might not have a telecommunications connection.

Paper
Listservs as Post-Teleconference Support for Community and Technical College Faculty

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Key words: telecommunications, Internet, listservs, teleconferences, community colleges, technical colleges, faculty development

Abstract

STARLINK® is a satellite-based two-way audio, one-way video teleconferencing network providing faculty development for community/technical colleges in Texas and nationally. In 1993-94, three listservs were established for follow-up to teleconferences. Two surveys were administered for this dissertation case study, one immediately following teleconferences and the other after the users had had an opportunity to test the listservs. This paper summarizes results.

Introduction

There are more than 1,200 junior and community colleges nationwide which enroll almost 50% of all students in higher education in the United States (Bleed, 1993a, p.21). Community colleges and two-year technical institutions in the United States face increasing challenges to provide education and instruction for an expanding and diversified student body in a rapidly changing world. To meet the needs of students for current instruction, higher education institutions and state agencies have been developing new technology delivery systems to provide faculty development through distance learning. STARLINK® provides such a service with two-way audio and one-way video.

Background of the Study

STARLINK®, a satellite-based teleconferencing network, provides faculty development for community/technical colleges in Texas and across the nation. Established in 1989 (Neal, 1992) the network currently consists of 73 Texas community/technical colleges using one-way video and two-way audio to bring together national experts and college educators to discuss critical educational issues.

Evaluations by participants over the last five years have been quite positive. A report of the third year (The Resource Group, 1992) indicated that "For all but one teleconference, at least 70 percent of participants reported that new, useful and/or interesting information was presented and that the overall experience was positive, and they will encourage others to attend in the future" (iv).

Weaknesses of the teleconferences were also reported. Post-conference activities were conducted at the downlink sites only 43.2% of the time for the ten teleconferences reviewed in the Resource Group report, despite the fact that STARLINK® provides follow-up printed materials to support the campus moderators. Only about 26% of all participants from the teleconferences were being provided with follow-up activities that they considered helpful. This aspect concerned Henry Hartman, the Dallas director of STARLINK®, because most of the teleconferences produced in the past have been "stand alone" presentations rather than series.

Main Problem Statement

Can the combination of teleconferences and a listserv service satisfy the perceived needs of participants for information and learning better than just the teleconferences alone do?

Purposes of the Study

- To determine if combining two-way audio and one-way video satellite teleconferences with a follow-up Internet listserv satisfies the perceived needs of participants for additional information and learning better than just video/audio teleconferences alone do.

- To estimate the appropriateness of having listservs provide follow-up activities for teleconferences as determined by self-reports including participants' computer experience, knowledge of Internet e-mail, training needs, and preferred modes of training.

- To determine the purposes of participants' accessing a listserv and to asses whether the listserv:
  a. facilitates changes in the way they perform their work
  b. is supportive of their teaching
  c. provides learning resources beyond the content of the teleconferences.

- To identify helping and hindering forces at work on the college campuses that may affect the use of telecomputing and the accessing of listservs by participants.

- To determine what aspects of a listserv are most helpful or not helpful to participants.

Review of the Literature

The STARLINK® research addressed the issue of whether teleconferences, in conjunction with listservs, can provide faculty development that more fully meets participants' needs than can teleconferences alone. The literature indicates that services similar to STARLINK's have been developed in other states for faculty development at the community college level. Elgin Community College (1989) developed a vocational education satellite teleconference project that provided programs for four Illinois community college sites for vocational educators. However, examples of projects combining satellite delivery and listservs for faculty development at community/technical colleges *before* the multimodal STARLINK® project was initiated have not been found.

The University of Georgia's (1987) Division of Vocational Education gave the following recommendations for successful teleconferencing: make instruction "high touch" and interactive, prepare the participants in advance with materials and agenda, and realize that teleconferencing is different from face-to-face instruction. The STARLINK® teleconference producers apply these principles of teleconferencing by including telephone question periods and also by providing support printed materials and agendas (Godfrey, 1989). The STARLINK® listservs research was conducted to investigate another form of interactivity.

Higher education institutions, including community college campuses, are increasingly being connected to Internet (Knapp,1993) and access to electronic mail given at least to faculty and in many cases to students (Bleed, 1993a, 1993b). Electronic mail is being used to support instruction (Fredrickson, 1992; Mason, 1989; Mason & Kaye, 1990) and inservice training (Gray, 1989). Computer conferencing is used for accessing adult education courses at any time of the day (Seaborne, 1987).

However, Anandam (1989) reported from site visits to fifty 2-year colleges that in some areas computer technology had not been used to its full potential (pp. 28-35). A STARLINK® survey, conducted in April 1993, indicated this was also the case in Texas community/technical colleges relative to electronic mail and Internet access.

Various combinations of multimodal distance learning are being used by students and teachers in higher education and continuing education (Steinert-Threlkeld, 1993; Mind Extension University, 1993). These include delivery systems for video (satellite, broadcast, cable, compressed video, videotape) in combination with telephone, fax, electronic mail (Suciati and Pusch, 1992), bulletin boards (Mind Extension University, 1993), listservs or newsgroups (Siegel, 1993), or by postal mail service (Steinert-Threlkeld, 1993).

Community college courses delivered by telecommunications have combined in various ways: computer conferencing, voice mail, telephone, audio conferencing, fax, the postal service, and video using cable, broadcast television, videotape and/or compressed video (Lemke et al., 1992, p. 511). A critical success factor for such telecomputing projects was the frequency of log-in by the professor, facilitator, or expert for the listserv, bulletin board, computer conference, or e-mail service (Torbet, 1993).

Examples of multimodal distance education were found at the community college level that combine telecourses with computer networks, but only for student programs. The Oregon Community College offers a complete two-year AA transfer degree combining telecourses with Ed-Net, a computer network (Oregon Community College Telecommunications Consortium, 1992). The Northern Virginia Community College Extended Learning Institute (ELI) has provided distance learning courses for an Associate in Science Business Administration using various modes of instruction, including computer conferences (Toby Levine Communications, 1992). The Community College of Maine (MacBrayne, 1993) is a distance learning network offering associate degrees via interactive television. In 1993, that institution planned to use computer conferencing to support instruction.

Other models of the use of telecommunications for instructional support at the community college level are available. Whitaker (1990) wrote an article about Austin (Texas) Community College's participation in a telecommunications project involving Adelaide College (South Australia) and Rio Salado Community College (Arizona) that included supporting professional development.

There has been extensive research in computer-mediated communications (CMC). One study found that factors with the greatest impact upon adoption and use of CMC were:

1. administrative support and use
2. encouragement of local innovators in schools
3. access
4. expansion of on-line resources
5. providing adequate time to learn how to use on-line resources and to establish critical mass of users (Basham, pp. 2509A-2510A)

A large number of potential users of CMC were prevented from access to the Native American Educational Network due to lack of training, insufficient on-site support, and technical difficulties (Basham, 1992, p. 2509A).

Some factors influencing the use of telecommunications are knowing how to use computers, ability to type, articulation skills, amount of teacher training and on-site support, administrative support, organizational culture, encouragement of local innovators, amount of time available on the system, individual needs including professional knowledge, availability of multiple phone lines or local area networks in institutions, ease of use, and economical, technically dependable systems (Andrés, 1993; Bacsich, 1987; Basham, 1992).

Beals (1992) found that CMC messages which include a personal event narrative, and longer messages, receive more responses. Harasim (1986) reported that women are able to express themselves more easily and fully with CMC. However, Smith (1986) found that asynchronous computer conferencing for task-oriented problem solving may have a detrimental effect on the completeness of the information exchanged, on the relevance of the information shared, and on the completeness of the consideration given to all aspects of the problem.

Others have found advantages to CMC. It does not require the simultaneous presence of people; it provides enhanced opportunities for dialogue, debate, and conversational learning; it may give a sense of community and affiliation; it facilitates thinking through writing; it supports the emergence and cooperative construction of knowledge and comprehension while providing less pressure to generate impromptu answers; and it can provide self-documentation (Bacsich, 1987; Harasim,1986 & 1990; Harris, 1993; Mabrito, 1990; Mason & Kaye, 1990; Walther,1992).

Attrition rates of participants leaving an on-line course vary depending upon the course. Those who teach on-line courses have found that the more structured the course (specific length to course, specific subject, credit given, specific assignments, instructor support, same or similar computer service being used by participants) the lower the attrition rate (Andrés, 1993; Odasz, 1993; Schrum, 1993). Mason (1989) has indicated that the "life-blood of a conferencing system is the contributions and interactions of its users." Romiszowski & de Haas (1991) have given specific suggestions for on-line group facilitators. Studies have indicated that CMC's usefulness depends upon certain factors, including the participants' learning styles, students' purposes and goals, costs, computer interface, and individuals' reinforcement needs (Schrum, 1993).

In this literature search, some organizations have been found that are successfully using telecomputing for on-line courses and course support, and others that are combining teleconferencing and telecomputing to achieve their goals. However, no specific study that combined satellite teleconferences with listservs for faculty development at the community college level was found before conducting the STARLINK® research.

The Research Study

A preliminary survey of participants after the April 1993 teleconference found that out of 74 responses, 33 STARLINK® participants said they had Internet access, 38 said they had no access, one said he or she had a modem but no access to Internet, and 2 said they did not know. Of the 20 Texas colleges represented by participants in the survey, only 4 colleges were said to have no access to the Internet (as indicated by 5 of the surveys). It was also known that at least 6 additional Texas community/technical college campuses also had access to Internet directly through THENet (the Texas Higher Education Network).

Therefore, at least 22 Texas community/technical colleges at the time (April 1993) had access to the Internet. This represented about 30% of all the community colleges and two-year institutions in Texas. It was determined that there were a sufficient number of campuses in Texas with known access to the Internet to proceed with establishing a listserv service for the study.

In the Fall 1993-Spring 1994 season, three Internet listservs were established on a computer in the Department of Technology and Cognition at the University of North Texas for follow-up to five STARLINK® teleconferences.

Surveys were administered immediately following the teleconferences to determine how long participants had used computers, if participants knew how to use Internet e-mail, extent of training needed for using Internet e-mail, how helpful resources would be for learning the Internet, accessibility to Internet e-mail—how it was provided, hindrances to using the Internet, helpfulness of a listserv for interacting with STARLINK® participants, plans for listserv sign-up, whether follow-up activities after the teleconference were helpful, the institution's name, and individuals' e-mail address. All participants were given listserv sign-on information sheets. Having signed on, participants were automatically sent a welcome message and a listserv guide via e-mail.

Experts from the teleconference programs were on the listservs as well as participants. The teleconference topics included Global Connection: Internet in the Classroom (40 listserv participants), Educational Use of Copyright Materials (14 listserv participants), and a three-part series, Teaching Strategies for Today's Classroom (60 listserv participants).

Summary of Results

The main study (Teaching Strategies) involved downlinks to 210 sites in the United States and Canada. Data analysis indicated that 81 institutions (28 Texas community colleges, 47 community colleges outside Texas, 10 higher division universities) were represented by the surveys administered immediately following the teleconferences Approximately 25% of participants (28 people) on the three listservs filled out and sent back the follow-up Internet e-mail survey after experiencing the service for from three weeks to four months.

1. For most of the participants who answered the e-mail survey after experiencing the listserv service, combining two-way audio and one-way video satellite teleconferences with a follow-up listserv satisfied their perceived needs for additional information and for learning more than they did with the video/audio teleconferences alone.

   - 80% (20 people) of TEACHTEK listserv responding participants (25) indicated that the teleconferences and listserv combination satisfied their needs. All people (3) on the other listservs who sent in the survey agreed.

   - Those experiencing the STARLINK® listservs found them to be helpful. 92% of TEACHTEK members and all 3 members of the other listservs said that they would sign up again for a listserv if STARLINK® provided the service for teleconferences.

2. It was determined that it is appropriate to have listservs for follow-up activities for teleconferences, given the following:

   a. Participants have access to Internet:

- At least 22 community/technical colleges in Texas have Internet access as indicated by the research. 37.9% of Texas participants (94 of total 252) surveyed had access via their institutions or via modems.

- 47.2% (131 of total 278) of community colleges outside the state of Texas have access.

- 61.4% (61 of total 94) of upper division have access.

- The trend is toward more people gaining connection to the Internet.

b. Computer experience and knowledge of Internet e-mail:

- Between 84% and 87% of faculty have knowledge of how to use a computer.

- Only 25% to 30% of community and technical college faculty surveyed are familiar with electronic mail. STARLINK®'s target customers are faculty at this level. This limits the available clients for listservs at this time.

c. Training and preferred modes of training:

- Participants agreed that workshops and friends or colleagues were the best ways of learning to use the Internet. This should be taken into consideration when planning faculty development.

- 50% of faculty surveyed in the study in community college in Texas think they need much or extensive training to learn how to access a listserv, and 38.5% of community college faculty surveyed nationally said they needed that level of training.

d. Participant sign-on and response

- Over 100 people signed on to the three listservs (two for pilot, one for the main study). Listservs are voluntary. Many people "lurked" on the listservs, that is, they read or did not read the mail and did not participate by sending messages back. It is difficult to know what these people thought of the value of the listservs.

- 45% of people on the TEACHTEK listserv, the largest of the three listservs, responded to the second e-mailed survey.

e. The director of STARLINK® in Dallas determined that the listservs provided a valuable service and plans to have them continue in the 1994-95 season.

3. Purposes for participants' accessing a listserv

a. TEACHTEK participants' resultant ranking:

1. Professional development
2. Curiosity

3. Answers to questions
4. Technological support
5. Other (including to learn what others have done in similar situations)

b. The listservs facilitated changes in the way faculty perform their work and teaching:

- 44% indicated that the TEACHTEK listserv had facilitated changes in the way they do their work (even though the listserv had run only about one month before the survey was filled out).

- 50% said the TEACHTEK listserv supported their college teaching.

c. Learning beyond the content of the teleconferences.

- All except two participants on all the listservs agreed that the content of the listservs provided learning resources that extended beyond the original content of the teleconferences.

4. Helping and hindering forces at work on the college campuses affecting the use of telecomputing and the accessing of listservs by participants.

- Helping forces on campus: easy access to Internet provided by institution, institution workshops, colleagues, local gurus, and computer consultants.

- Hindering forces: lack of access to Internet and lack of training are the major hindrances to participants' using telecomputing. Until campuses provide access to the Internet, STARLINK® participants will be prevented from participating in STARLINK® listservs. However, in one case, a participant asked a question for a colleague who did not have an Internet address!

5. Most helpful and least helpful aspects of the listservs:

- Helpful (in order of preference): resources of experts, concept clarification, learned about Internet, met new colleagues, questions were answered. Also, listservs helped by reinforcing ideas and applications, allowed participants to see what others are doing in teaching, provided a helpful moderator, provided answers to questions in a non threatening off-campus venue.

- Not helpful: e-mail box filled up with messages, not enough people on listservs, not enough discussions generated.

The full dissertation of this paper provides much more detailed statistical data analysis.

Summary
Teleconferences combined with a listserv service for faculty development at the community college level can satisfy the perceived needs of participants for information and learning better than teleconferences alone can.

Observations of the Listserv Moderator

- It is important to have a listserv system up and tested before participants sign on.
- An automatic welcome message with a listserv guide works well.
- A moderator's sending response messages to all the participants' introductory messages facilitates discussion.
- The moderator and others need to provide information about the system or Internet to facilitate participation.
- Moderators need to check the listserv traffic often to provide assistance. This is appreciated.
- Moderators need to have extreme patience, particularly with novices.
- It is helpful to have experts from the teleconferences available on the listservs to answer participants' questions. One participant objected to the concept of having "experts" on a listserv.
- Moderators need to help members to be sensitive to other members' feelings.
- The moderator should be knowledgeable in the fields that are being discussed in order to facilitate and lead discussions effectively
- Those who administer an e-mail survey should volunteer to send out hard copies for novices.
- It takes time to moderate a listserv effectively. Be sure you have the time to give to the project.

Listserv Software: Mercury software, by David Harris. Software is free with on-line instructions. Documentation available for a fee. David Harris, Pegasus Mail, c/o David Harris, P.O. Box 5451, Dunedin, New Zealand; e-mail: david@pmail.gen.nz; Tel. +64-3-453-6880, FAX: +64-3-453-6612.

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Internet Project
Challenges in Managing Cross-Networked Educational Projects

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Key words: education, network, project, management

Abstract

Success in managing on-line educational projects that cross network boundaries may depend on our ability to use Internet technology to develop standard tools and techniques for common management problems.

Sewing Together the Pieces

While the promise of on-line networking for education is a global "classroom without walls," what is actually developing is a Balkanized virtual universe, seemingly connected but strongly divided along geographic, economic, and social boundaries.

What will it take to have sustainable, networked educational projects that preserve local autonomy but pose few barriers to free interchange and collaboration across networks?

This presentation will focus on critical elements of success for managing on-line educational projects that cross physical and managerial network boundaries. It will draw upon the experiences of existing and past projects, including I*EARN, GREEN, and PLANET, and on the observations of the audience.

We will examine how integration of Internet tools can provide a management structure to help address common challenges in on-line project work, including administration, scheduling, marketing, finances and fundraising, group decision-making, curriculum integration, regional network user support, software development, project facilitation and mentoring, partnering, training, documentation, and evaluation/assessment.

Task-Oriented Planning And Evaluation

Every process or function in the management of a networked educational project is composed of one or more tasks. Each task has a starting point and a goal. A task may be as simple as making a decision or taking a single action, or it may be very complex, made up of many sub-tasks, like facilitating an on-line project.

Progress toward goals for complex tasks can be assessed by setting benchmarks, points of reference, or standards assigned as measures of completion or success.

Task-oriented management planning, using benchmarks to assess progress, is useful in complex management situations, such as putting a human being on the moon or coordinating a global educational telecommunications project. It offers a standard structure that all participants can understand and agree to use, allowing each greater opportunity to be well informed and able to participate in a meaningful way.

Task-oriented planning also lends itself to the graphical display of multiple tasks, across multiple projects, over time. Thus it allows comprehensive pictures to be drawn depicting all or a portion of the activity in an effort. Such pictures allow more direct perception of complex abstraction—like the cumulative impact of thousands of young people doing action-oriented projects via computer terminals all over the planet.

Use of standard formats for task-data files allows sharing of task-oriented planning information via computer networks and between different computer programs (project managers, spreadsheets), making management planning and project assessment information more broadly available. This information can allow a "flattening" of management structure and spreading management responsibility at all levels of an organization as appropriate. But while this works in enterprise-wide solutions geared to business needs, development of standards-based data-sharing tools on the Internet for education programs is still in very early stages. Projects such as TERC's Alice software development and data-sharing software being co-developed by the University of Michigan, the Global Rivers Environmental Education Network (GREEN) and the Lawrence Livermore National Laboratory are starting to address this need.

Conferencing

Asynchronous electronic conferencing is used by GREEN and the International Education and Resource Network (I*EARN) as the principal method for on-line group discussions, project tracking and record-keeping. It offers an easy-to-use structure for distributing documents or for carrying on an ongoing "conversation" among many people who don't have to be in the same place at the same time. Conferencing, unlike private e-mail, maintains a complete and well-organized record of project proceedings that is accessible to all participants at any time and that ultimately becomes a "product" of the project.

These on-line electronic conferences follow the format standards for Usenet newsgroups, but access is limited to project participants. Each conference is stored as a single file on a host computer system. The conference file is subdivided by "headers" that structure the file according to subject topics and responses to those topics. Topics and responses are generally textual information, but may include "enclosures" of binary information such as graphics, data files, or computer programs. Essentially, each electronic conference is a text database, the structure of which is managed for the user by the conferencing software of the host system. These conference files may be transferred (linked) across multiple computer systems that are each capable of interpreting the file structure via newsreader software.

Electronic conferences may be structured differently and subjected to different levels of "moderation" or "facilitation" to suit different purposes. In facilitated conferences, the facilitator generally takes the role of guide, advisor, and janitor, helping to shape the conference via suggestion and minor adjustments of topic/response placement and titling. In a moderated conference, all postings are first sent to the conference moderator, who decides if, how, and where they will be placed in the conference. Without the establishment of structure and goals for facilitation or moderation at the outset, an electronic conference tends to be a free-form collection point for random documents, questions, and discussion. Just as peas in a garden will grow without a trellis, a conference can grow without a structure, but it is likely to be haphazard and less productive than a structured and facilitated or moderated conference.

Limitations on the use of electronic conferencing include the inability of many telecommunications networks to access Usenet-format conferences, or an inability to limit access to conferences by group or individual user. One method of circumventing this barrier is to have the postings to a conference sent automatically via e-mail to individual conference participants, and to allow those participants to post to the conference via e-mail. Conferences may also be linked to automated mailing list software to reduce the labor required for maintaining e-mail links to conferences.

While electronic conferences are essentially "databases," they do not provide logical querying tools that enable powerful searching and comparison of information. While conferences are useful for some information-sharing, they are only marginally adequate for functions such as list-keeping, partner-matching, and project-tracking.

Textbases

As described above, an electronic conference is essentially a textual database file. An on-line conference can be converted into an "indexed" text database that can be searched for text strings (words) using software such as that following the Wide Area Information Systems (WAIS) standard developed by Brewster Kahle. Text strings can be combined in the search using a limited set of Boolean logical operators ("and" and "or") to narrow the focus to specific areas of interest. A conference can be either full-text-indexed, meaning every word of the text it contains is searchable, or the indexing can be limited to only the title lines of topics in the conference file. Thus, through planning an on-line conference can be turned into a more powerful on-line tool.

For example, teachers or students accessing the iearn.ideas conference must now look at the entire conference index to find projects that may be of interest to them, then read individual topic descriptions for further detail. In all, the process is time-consuming and costly—for both on-line time and teacher time. I*EARN plans to index portions of the conference as a textbase, so teachers and students may search for specific subject key words that fit their educational interests. Providing a full-text-indexed form of a conference does not limit access to the non-indexed conference, though it may require more strict adherence to formatting rules.

WAIS-indexed textbases may be searched remotely over Internet connections, by users whose systems provide access to Telnet or WAIS-querying tools. Information-retrieval tools such as Gopher and World Wide Web (WWW) browsers can make access to WAIS-indexed textbases available widely and easily on the Internet.

The main limitations on full-text-indexed databases and their kin are lack of access on some networks to on-line querying tools and the cost of interactive on-line access, which is still prohibitive for most schools. To overcome these barriers, conference files may also be linked to text databases that may be queried remotely via electronic mail. Software such as LISTSERV or Almanac includes file-retrieval options that allow searching and retrieval of text information via an exchange of simple e-mail messages.

Databases may also be useful for building and maintaining directories. A teacher/classroom partnering directory, for example, could allow participants to search for others whose curricular interests and class/learning level match their own. Similarly, a database of volunteer mentors or subject-matter experts could allow matching of networked projects with experts in business, government, and academia.

Forms provided in on-line conferences and file-retrieval systems, or via the forms feature now incorporated in WWW browsers, could be used to allow teachers and mentor/experts to provide information about themselves for partner matching. Such a system would be an interactive database maintained by the users themselves. Entries could be automatically retired after a set period of time and returned to the originator for revision and re-posting, if appropriate. Such a system could extend the utility of services such as the Kidsnet "Teacher Contacts" files maintained by Sally Laughon of Virginia Tech (URL: Gopher://informns.k12.mn.us:70/11/best-k12/teacher).

Integrating On-line Tools

None of the database, file-retrieval and project management tools described in this section exists in isolation. Each is an option which may be more or less appropriate in any given situation, and for the successful use of each, human support in the form of user manuals, on-line e-mail support, and group-process facilitation is important.

But taken as a whole, the development of universal partnering forums/databases integrating human support with standard on-line tools, including e-mail and conferencing, WAIS, Gopher, FTP, on-line mailing lists, and query-by-e-mail databases can provide a useful tool kit for organizing and accessing information about:

- clearly defining goals, objectives, expectations, and timelines, and evaluating success in meeting them
- projects looking for participants
- success stories/models of completed projects
- partnering between schools, classrooms, teachers, and youth service groups
- on-line mentor matching
- access to on-line education resources
- cumulative assessment of the benefits of networking in education

Certainly, managerial challenges remain that cannot be solved by technology. But as the use of on-line networks for educational projects grows, agreement on standard methods for exchange of project information will be essential if we are to avoid creating a fragmented technological approach that fails to achieve its potential for empowering young people with skills that will help them shape their information-driven society.

Further information on GREEN and I*EARN is available by sending blank e-mail messages to green-info@igc.apc.org and iearn-info@igc.apc.org.

Paper
Reading/Writing and Telecommunication: Content-Learner Match

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Abstract

The purpose of this research project was to investigate the effectiveness of instruction using

telecommunication techniques and the learner-content match model. The learner-content match is based on the cognitive/learning style model.

One university professor, six public school teachers and one hundred and twenty seventh-grade students were involved with the project. The title of the assigned project was "Reading-Writing and Telecommunication." The content of the project dealt with the holidays around the world. Six schools represented six countries: United states, Japan, India Russia, Mexico, and Israel. The task of the students, under the guidance of the teacher, was to gather all the details about the holidays pertaining to the country they represented. They gathered this information using the library, interviewing local experts, and telecommunicating with the students of the country they represented. All the teachers utilized the same procedure to obtain the project information. The students were taught interview techniques, questioning techniques, and procedures pertinent to telecommunications. Time was allotted to the project during the school day. All the students completed the project within the allotted time of six weeks. The project was a success in terms of student productivity, collaboration, motivation, and performance. In addition, the project's success was also based on the input received from the parents, the teachers, and the students.

After analyzing all six projects, it was clear that several factors were responsible for the project's success. The project was relevant both to the teacher and the student. Another important factor to project success involves the project's appeal to the parent, because family support is needed. In addition, the following factors proved to be beneficial: establishment of a learning environment, students receiving feedback, studentinteraction, teachers helping students to keep up with their assignments, and counseling and advising support. It was also important to design the project so that all the students were actively involved. If all these factors are considered in project design, distance learning will enhance student satisfaction, motivation, productivity, and performance.

Teacher Training

Teaching Teachers Technology On-line: An Evolving Introductory Course

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Key words: training for technology, teacher education

Abstract

Starting in the fall of 1992, on-line technology changed from a topic in an introductory computer course for teachers to a major part of the conduct of the course, occasioned by participation in an experimental AT&T Higher Education Learning Circle and the instructor's absence for a conference in China. Student interest was high, participation by students whose native language

was not English improved, and continuing contact with students after the end of the course was much greater than expected.

The on-line part of this course in spring 1993 was not as well received. More is NOT better without careful management of quantity and timing of material delivered on-line. Too much in student e-mail boxes also discouraged student interaction on-line. Having universities in distant places on-line did help improve student interest, a feature that has and will be continued. Evaluations indicated that some students felt there was too much material in the course; many also felt they needed all of it and there was no place else they could get it, and/or that there was no time in a tight curriculum for more than one course.

The fall of 1993 was a time of better integration of regular course content and on-line activities. Telling students where something was and how to get it or furnishing it on diskette was more effective than simply sending it to them via e-mail. Students doing different things and reporting to the class worked well once the students understood they were doing it for their classmates, not for the teacher. The traditional concept of a course as a finite length of time with accomplishment as the variable (and hence, the grade received) gave way to the concept of a course as demonstrating a skill/knowledge level and the variable is the time to acquire it (whether the registrar liked a number of incompletes or not).

During the spring 1994 term, a number of new factors had to be considered in the course, including:

- *extensive public interest in the "Information Highway" and student perception of the course as their on-ramp to it*
- *in-service students at a distance who could not always come to class and who had access to different software than was available in the on-site lab*
- *different e-mail systems and Internet access, varying in types and size of files permitted, availability of GOPHER, length of time a student could stay on at a time, etc.*
- *increasing variety of previously -acquired skills, ranging from students with no skills to computer science majors who knew how things worked but wanted to know what to do with them*
- *increasing class size, putting a strain on available equipment and instructor time*
- *An occasional student apparently incapable of developing quality responses in the busy and demanding environment of the course*

Forthcoming changes proposing to integrate technology into the curriculum and eliminate the undergraduate education major are expected to have a profound effect on the further evolution of this introductory course.

Project PreSTO (Preservice and Student Teachers On-line) Works Wonders

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Key words: teacher education, pre-service, student teaching, telecommunications

Abstract

PreSTO is an Internet discussion list for pre-service and student teachers enrolled in teacher education institutions around the world. Individuals who are undergoing training to become certified teachers need to have an electronic support system. The Internet is an environment that promotes interaction for this population of people. Since such a need existed, a group of visionary educators moved to make this wholesome scenario become a reality.

During a meeting of the Consortium for School Networking (CoSN) at Tel•Ed '93 in Dallas, Texas, members were reminded that discussion lists existed for almost every niche in education except pre-service teachers. At that point, John Clement suggested the formation of an Internet discussion list specifically for both pre-service and student teachers. Two missing pieces were locating a university that would host the discussion list and a person who would serve as the list manager. No immediate solution became apparent.

Later during the Tel•Ed conference, Sue Espinoza (East Texas State University) contacted Larry Anderson and asked if he would volunteer to support such a discussion list. In short order, Mississippi State University became the site for what was to be known as PreSTO (Preservice and Student Teachers On-line), and Anderson became the list manager. PreSTO thus was born out of a need and has served hundreds of teachers-in-training around the world.

PreSTO is designed for pre-service teachers who are engaged in a teacher-training program and for the students participating in the field-based experiences. Often, they have specific, questions, concerns, and celebrations peculiar to their situation but they have no place to share these experiences in a non threatening environment.

During the initial year of operation, we have seen a broad range of conversation topics appearing on the list. A few topics that have generated the most discussion have been: multi-age classrooms, electronic portfolio assessment, corporal punishment, site-based management, a comparison of teacher education programs and their procedures, multicultural sensitivity, computers and curriculum, freedom versus pay, theory versus practice, school choice, year-round schools, home schooling, heterogeneous grouping, teacher stagnation, outcomes-based education, the teachable moment, and Logo in the classroom.

Many users of the discussion group have commented that these conversations have broadened their education. In addition, they spoke of ways that they have been able to use information obtained through PreSTO in other classes they have taken. Certainly, the presence of PreSTO has contributed significantly to a richer educational experience for pre-service teachers as they enter their professional careers.

PreSTO is designed for the students. Many faculty are subscribed to PreSTO; however, they are encouraged to keep silent until they perceive their participation to be essential. This arrangement ensures that the students will have a forum in which they feel completely free to speak and don't focus on the faculty members' breathing down their necks.

Panelists assembled to discuss PreSTO will relate how they have both affected and been affected by PreSTO. The panelists come from different backgrounds and bring distinctive influences to the discussion group.

The subscription address for PreSTO is istproc@ra.msstate.edu and the one-line message should read "subscribe presto (your name, affiliation)." After you have become a member of the discussion group, you will send e-mail to presto@ra.msstate.edu. We look forward to having you

Policy
National Center for Technology Planning: On-line Smorgasbord

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Key words: technology planning, strategic planning, telecommunications

Abstract

The National Center for Technology Planning, as one of its functions, maintains an on-line repository of technology planning aids. Collecting, preparing, and maintaining this amassed information has been a formidable task involving hundreds of hours of labor. Informing educators around the world about what exists in the repository, how to access it, and how to use materials when they acquire them has been a full-time job.

The creation of an Internet on-line smorgasbord has involved work performed by various individuals around the globe. To appreciate more fully the quantity and quality of work that transpired to bring these resources to bear, the user should be made aware of the activities that took place. In November 1992 Dr. Larry Anderson submitted a call for schools and school

districts to submit their technology plans. Most of the technology plans collected were in paper form. While that was better than nothing, it didn't profit all the thousands of educators who wanted to download the materials via an electronic network. The solution to the problem in the beginning was to take these plans and scan them page by page, using Optical Character Recognition (OCR) software. This was done.

Two dilemmas became obvious very early. First, not all the plans could be scanned; many contained beautiful charts and graphs ,which would not be converted into a text-only format, so they were set aside. Second, even after great care with the scanning setup, there remained a tremendous quantity of proofreading to ensure that the final document matched the original. This was not an easy task, NCTP personnel felt it necessary to call in some additional proofreaders.

Dr. Anderson issued a call on the Internet for anyone who would be willing to download some of the "rough" files, proofread them, clean them up, and then upload them to the NCTP FTP archive. One of the individuals who volunteered immediately was Chip Daley, of Las Vegas, Navada. When asked to describe what role he played in this process, Chip stated:

> *Let me see . . . what I got, what I did, and what happened from there on . . .*
>
> *Well, basically, what I did was volunteer to assist Dr. Anderson in cleaning up some of the scanned technology files that he would receive. Using FTP (which stands for "file transfer protocol," a method for transferring files from one computer to another), I would transfer the file to the machine at UNLV and then download it to my machine at home. Then I would convert the ASCII file to WordPerfect . . . clean it up as best I could, and then place it on the FTP site here at UNLV. Reversing the process, Dr. Anderson would FTP the cleaned-up file from the FTP site here at UNLV. . . and hopefully have in his possession a nice technology planfile for use by the NCTP.*
>
> *Maybe there was a unique reason for doing all this. . . I didn't know Dr. Anderson at that time, and it gave me an opportunity to share some basic beliefs I hold about educators sharing and collaborating.*
>
> *You see, I think the educators on the Internet have the unique opportunity to form a community. As part of that community, I believe, we are obligated as members to help one another . . . to support one another, and to take care of one another . . . and so I thought at that time (and still do) that it was my duty as a member of this fine community to help Dr. Anderson clean up the technology plan files.*
>
> *Just a thought. . . as far as anything I did for the NCTP. . . it was a pleasure.. :). . . I cleaned up a few plans. . . and made a new friend from the community! I'm a rich man!*

Chip made a remarkable contribution to the NCTP on-line smorgasbord. Since his work, early in NCTP history, both the quantity and the quality of available materials have improved. Many people around the world have offered fantastic resources to the Internet archive; their enthusiasm to do so was prompted, to a great extent, by the sterling efforts exerted by people like Chip Daley.

Users who navigate to the NCTP archives will find not only technology plans available for browsing (through Gopher and Mosaic) and downloading, but numerous planning aids in the forms of sample public service announcements, faculty technology surveys, brochures, essays on critical issues in technology planning, sample planning timelines, and a wide variety of related materials. This compilation will continue to grow over time. Surely, just as a restaurant smorgasbord contains both common foods and delicacies, the National Center for Technology Planning offers a smorgasbord containing materials that meet needs in various ways. Eat hearty!

Networks
The Amazing Global SchoolHouse Project: Showcasing Live Video and Audio Conferencing over the Internet

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Project Overview
The Global SchoolHouse (GSH) Project is an internationally recognized activity that networks classrooms across the United States and overseas to demonstrate the use of the Internet in the K-12 environment. The project utilizes newly emerging last-mile connectivity solutions (CATV), developing collaboration technologies, new interfaces, and advanced information discovery and retrieval tools with low end (Macintosh or PC) computers.

Highlights of the GSH activity involve live video conferences among the students, teachers and electronic "visitors" (including scientists and government officials) using Cornell University's CU-SeeMe software and telephone audio and, more recently, audio transported over the Internet using the University of Illinois developed Maven software. Former Surgeon General, Dr. C. Everett Koop, Dr. Jane Goodall, Senators Feinstein of California and Kerrey of Nebraska, several members of the White House staff, and a variety of foreign diplomatic personnel have participated in GSH demonstrations during the last year.

Project Goals
- demonstrate how the Internet and its tools can function as a classroom resource
- teach students how to become active learners and information managers
- training and support resources for teachers so that they can use technology in an effective and appropriate manner

- emphasize real-time, interactive, state-of-the-art scientific and school-based applications of the Internet

- encourage business, school, and community partnerships for ongoing collaboration and support

Curriculum and Training

Current GSH project schools in the United States. are located in California, Illinois, Iowa, Missouri, Nebraska, New York, North Carolina, Tennessee, Utah, Vermont, and Virginia, with international participation from Australia, Canada, England, Germany, France, Finland, and New Zealand. The schools are grouped into four clusters, each studying a different topic chosen by the teachers, in a manner that is appropriate to the level of the students at each location. (Grade levels in the GSH range from elementary to high school.) The broad topics being studied are space, energy, waste, and weather.

During the spring, in conjunction with the activities in the class rooms, it is anticipated that the students in each cluster-group will conduct at least one live video conference with a high-level government official in their area of study to discuss the results of their research and ask and answer questions. The advantages of such an activity are to stress the importance of education to the national leadership, demonstrate the accessibility of the government to the public via the Internet, and promote early involvement in the processes of government by the students.

Elements of GSH

Eleven States/Twenty Schools

- California
- Illinois
- Iowa
- Missouri
- Nebraska
- New York
- North Carolina
- Tennessee
- Utah
- Vermont
- Virginia

International Participating Sites

- Australia
- Canada
- France
- Germany
- Japan
- Mexico
- New Zealand
- Norway
- United Kingdom, London

Curriculum and Special Events
- Energy, Waste Management, Weather, Natural Disasters, and Space Exploration Research
- On-line Environmental Fair
- Special Guest Interviews

Informal and Formal Training
- Original Core Team as Mentors
- Teacher/Principal Teams
- Side-by-Side Learning Model

Multiple Connectivity Options
- Multiple Speeds
- Telcos
- Cable Companies
- Wireless

Current Internet Tools
- CU-SeeMe
- Maven
- Blue-Skies
- Gopher
- Mosaic
- MacWeb

Macintosh and PC Platforms

Partnership Benefits
- Association with a successful, proven classroom collaboration
- High visibility in industry, government, and education communities
- Hands-on interaction with teachers and children in the classroom
- Technology trials with other industry, government, and education participants in a controlled environment

Expanding GSH
Current plans call for the expansion of the GSH model during the 1994-95 school year to recipients of the Presidential Awards for Excellence in the Teaching of Science and Mathematics in each state. Internationally, we have been advised that France desires to place forty schools in the project next year and that Norway, Germany, Japan, the Philippines, and several other countries are also planning participation.

Although current GSH project schools have already been selected, we would like to share our activities and findings with other schools around the world. Schools may elect to conduct similar activities at their sites, develop their own public awareness campaigns, and help build the Global SchoolHouse "Electronic Library."

If you have questions or would like to be added to the electronic mailing list that monitors and receives updates of this project, please send a request to: **Internet: andresyv@cerf.net**

The Global SchoolHouse Project is sponsored by the National Science Foundation with generous additional support from U.S. Sprint, AT&T, Cisco, SuperMac, Zenith Electronics, Cornell University, the University of Illinois, and numerous other organizations. Curriculum and classroom activities coordination is provided by Global SchoolNet Foundation (GSN) in California, with project administration, technical support, and training being provided by the Clearinghouse for Networked Information Discovery and Retrieval (CNIDR) at MCNC in North Carolina.

Spotlight on 1994-95 GSH Curriculum Projects

The following projects are a sampling of curriculum projects being developed by the Global SchoolNet Foundation that will be launched during the 1994-95 school year.

University of Song presents Number 1's of Tomorrow

In a first of its kind event, children around the globe to share their musical talents with the world via the Internet "information superhighway" and encourage talented students to pursue further education and /or a career in the performing arts or music composition. The talented singers and composers will perform in New York City at the United Nations Children's Summit titled "Children Talk to the World."

Student Quotes

"Sometimes I find out about things and places my teacher doesn't know about. Then, I get to be the teacher and it makes me feel important." (Bevin)

"Sometimes I don't want to be in school, but getting on the network lets me escape to other places. It makes school more interesting." (Carlos)

"I'm learning lots of things every minute I'm on the network." (Oscar)

"I love to explore new places and learn new things. The Internet is so big, I'm only getting started." (Jeremy)

Teacher Quotes

The availability of information on the network lets me custon ze my lessons to different ability groups without having to purchase multiple sets of textbooks." (Mrs. S)

"Using the Internet enables me to teach my students a very important skill -—how to be good information managers." (Ms. L)

"The Internet is amazing resource. It's as though there is a committee of people standing by ready and waiting for me to ask a question." (Ms. A)

"What I like best about the Internet is that it requires minimal effort for me to share my lessons and ideas with my colleagues." (Mr. R)

"I found the GSH project especially significant and ironic, because it used computer technology to help solve environmental problems — environmental problems that were a result of earlier technologies." (Mr.R)

Parent Quotes

"My son especially likes doing research on NASA Spacelink better than using textbooks, because it's interactive. When he doesn't quite understand something, he can post a question and receive an answer back via e-mail. He can't do that with a textbook!" -Mr. W

"Since my daughter got involved with the GSH project, she comes home everyday and tells us about the things she's learning. Before that, she shared very little about her school day with us." (Mrs. H)

"Working on the GSH project provided my son with a unique learning experience. We appreciate the investment that was made in our child's education. Thank you for making such a powerful tool available." (Mr. Y)

The Global SchoolNet Foundation

Since 1985 the FrEdMail has been a leader in the instructional applications of telecommunications. Today, the Global SchoolNet Foundation (GSN), a 501(c)(3) nonprofit corporation, is a major contributor to the philosophy, design, culture, and content of educational networking on the Internet.

The Goals of the Global SchoolNet Foundation Are to:

- Promote development of effective reading, writing, and communication skills in students at all grade levels
- Foster development of global, cultural, geographical, environmental, and sociopolitical understanding
- Establish collaborative partnerships and models among all segments of the community (including schools, universities, businesses, and government organizations)
- Contribute to a better understanding of communications technologies and promote their responsible and effective use in education
- Support low-cost, community-based, electronic data communications networks that provide all citizens equitable access to the basic information tools

Global Learning Centers

The growing FrEdMail BBS Network (a service of the GSN) itself continues to fill an important ecological niche in the world of educational networking. Over 200 FrEdMail Global Learning Centers, operating on Apple IIe/IIgs and Macintosh LC computers, provide free Internet e-mail access to thousands of teachers and their students across the United States. More than 12 direct Internet gateways, which connect a FrEdMail BBS directly to a Unix Internet host, give users their own Internet e-mail addresses. Because the BBS software can be operated by computer novices, many of our system operators are classroom teachers with no special technical training. FrEdMail helps bring the information age directly to schools and students who otherwise would wait years for the infrastructure to reach them. With a simple and low-cost FrEdMail Global Learning Center, they can begin immediately to enjoy the benefits of global links to educators around the world.

Global SCHLnet News

SCHLnet is "FrEdMail on the Internet." The exemplary FrEdMail projects and newsgroups, containing the finest collection of learning activities available anywhere are now available to schools on the Internet via our SCHLnet subscription service. SCHLnet utilizes standard Usenet transfer protocols and message format to create the first professionally managed distributed conferencing service aimed specifically at teachers and their students. SCHLnet answers many of the concerns of educators about content and access on the Internet.

On-Line Collaborative Learning Projects and Services

Since 1985 GSN/FrEdMail has been setting the standard for asynchronous collaborative learning projects. GSN/FrEdMail's Eratoshenes, Newsday, Geogame, Santa Letters, and other projects are network classics of well-organized activities.

Our projects serve as models to teachers who wish to generate their own successful projects. In our role as "mentors" to the educational community, we

- conduct numerous model collaborative learning projects each semester, free of charge
- publish model lesson plans for collaborative projects
- assist teachers in designing and managing their own learning projects
- provide global newsgroups and listservs for teachers to advertise and conduct their own projects

To be placed on our project listserv, send a message to fred@acme.fred.org with the body of the message containing "SUB HILITES". (Note: do this ONLY if you are unable to access SCHLnet.)

If you want our guidelines for developing your own project, include the line "SEND GUIDELINES".

If you want to submit your own project for posting on our international lists, send your complete project description, formatted according to our guidelines mentioned in the previous paragraph, to call-ideas@acme.fred.org

Workshops and On-line Courses

The Global SchoolNet Foundation currently conducts two teacher workshops:

- Hello Internet, conducted on-site or on-line, introduces participants to Internet resources useful in an educational environment. (The most current resources are discussed and demonstrated.)
- Managing Global Learning Projects equips participants with the skills and resources to plan, organize, and conduct their own collaborative on-line projects.

TeleSensations, T'nT, Newsletter, Videos

Global SchoolNet also markets a variety of resources for teachers and school districts, including:

- TeleSensations is the finest telecomputing resource guide available for teachers. It contains more than 100 telecomputing activities that you can conduct with your students on-line, as well as a potpourri of helpful technical and procedural information, tips, and advice. This is a perfect textbook for teachers in training and a must-have resource for every school.

- T'nT Teachers 'n Telecommunications is a comprehensive syllabus for a 15-hour teacher training workshop, especially designed for district resource specialists, staff trainers, and others charged with training teachers in how to use telecomputing.

- Videotapes for telecommunications training

- Newsletter, published quarterly, containing a variety of articles and information about K-12 networking practices

For More Information
Additional information is available by sending a message to fred@acme.fred.org requesting info on the following topics:

- Global SchoolNet Foundation
- Global SchoolHouse Project
- FrEdMail BBS
- FrEdMail BBS/Internet Unix Gateway Software
- SCHLnet
- GSN collaborative learning projects
- Hilites (our projects listserv)
- Teacher training workshops
- TeleSensations
- Videos
- Newsletter

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Teacher Training
Training Teachers to Use Internet: A Case Study for Graduate Education

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Key words: Internet, computer-mediated communications, teacher education

Abstract

The presenters will cover the redesign of an existing graduate education course and the creation of a new course to integrate Internet use into instructional settings. These two courses, "Telecommunications for Instruction" and "Internet for Teachers," include in-depth training for students in the use of a variety of on-line resources, primarily Internet-based.

The existing course, "Telecommunications for Instruction," has evolved over several years from a small graduate seminar (usually attracting from five to ten students although offered only once a year) to a current enrollment of thirty utilizing an Ethernet-connected computer lab. The reasons for this growth have been twofold. First, the Educational Media and Computers program has grown recently because of interest in emerging educational technologies. Second, the class has been recently redesigned to make greater use of electronic mail and learn to access Internet resources for assignments, in addition to exploration of a variety of distance education technologies.

Although the new course, "Internet for Teachers," first offered in summer 1994, expands the networking section of the telecommunications course, it is designed primarily for inservice teachers who have had no exposure to computer-mediated communications. During intensive class sessions over three weekends, students learned to navigate the Internet searching resources through electronic mail, Usenet, Gopher, Listservs, Telnet, and Mosaic.

The presenters will discuss the evolution of these courses, provide syllabi and examples of assignments to attendees, and present their findings on student outcomes in both classes. The presentation will also cover the various resources that are available for educators on the Internet and other emerging educational networking technologies.

The Internet Course

Two sessions of EMC 598—"Internet for Teachers"— were taught for the first time during June and July 1994. The purpose of this course is to introduce students to the applications of the Internet for instructional settings. The course is designed for teachers, trainers, information specialists, librarians, and administrators to help them apply the latest developments in telecommunications technologies to instructional settings.

Topics covered included introduction to the use of electronic mail and educational uses of the Internet. The use of Internet resources such as Gopher servers, Veronica and Mosaic search software, net news groups, and listservs were discussed. Applications for the instructional use of these functions were presented. Finally, future developments and related educational issues of global networking were explored.

The objectives of the course were for students to be able to demonstrate proficiency in using electronic mail by sending and receiving messages, successfully upload and download files, locate and download information on the Internet using Gopher and Mosaic, subscribe to Internet listservs, and access Internet news groups.

There were no required texts for the course. However, the university's e-mail user's guide was strongly recommended. For students using e-mail from their own computers, the Kermit user's guide and ASU Kermit software were also suggested. Additional optional texts such as the *Big Dummy's Guide to the Internet*, *Hitchhikers Guide to the Internet*, and *Zen & the Art of Internet* were available from the Gopher server at INFO.ASU.EDU and students were shown how to download them, along with various other Internet guides, during the course.

All assignments were designed to provide students with practice and feedback in practical Internet applications. Assignments were uploaded to the instructors and other students via electronic mail. Student performance was assessed in three areas: class assignments, class participation, and group collaboration and presentation.

Students received basic e-mail account practice sending and receiving messages, setting up nickname files, signature files, and e-mail notebooks in which to log all class communication. They learned to upload files by writing their autobiographies in a word processing program, sending them to their accounts using Fetch FTP software, then distributing them to the class. They also used Veronica to search Gopher servers for material that would help them in teaching their subject areas, and they wrote reviews of what they found, uploading the results to the class and instructors with addresses for the Gopher servers searched. Other assignments had students finding and saving Mosaic URL's and Gopher addresses related to their educational fields, and saving them as hotlists and bookmarks for the rest of the class to access.

The classes were also divided into groups of three to six students. Each group reviewed a topic, using on-line Internet resources, that they selected and gave a thirty minute presentation, with handouts ,to the class. They also saved Mosaic hotlists and Gopher bookmarks that were put on a server so that the other students could access them. Group topics included: Internet Resources for Science and Math Teachers, Internet Resources for Social Studies Teachers, Internet Resources for Language Teachers, The Virtual Library, The Future of Telecommunications Technologies for Education, and The National Information Infrastructure Agenda.

Despite the relatively concentrated nature of the summer course, most of the students exhibited proficiencies well in excess of the course requirements. Many students became intrigued with the number and variety of Internet resources they found and compiled extensive lists. Several students in both sections of the course went beyond course requirements to produce some very creative Mosaic home pages that are now being loaded to World Wide Web servers.

Examples of Internet Resources Found by One Student

Big Sky Telegraph
North America/ USA/ Colorado/Boulder Valley S.D./ Lesson Plans/ Big Sky

SchoolNet
Address: Gopher.schoolnet.carleton.ca

Newton bulletin board
Address: Newton.dep.anl.gov

NASA Spacelink
Veronica/ K12 Related Gophers/ Other Education Related Gophers

Exploratorium
http:// www.exploratorium.edu/

The Subway
http://ucmp1.berkeley.edu/subway.html

Dinosaur Exhibit
http://www.hcc.hawaii.edu/dinos/dinos.2.html

Australian National Botanic Gardens
http://155.187.10.12/anbg.html

Charlotte, The Vermont Whale
http://www.uvm.edu/whale/whalehome.html

EXPO
WWW exhibit organization http://sunsite.unc.edu/expo/ticket_office.html

Journey North to the Arctic
http://ics.soe.umich.edu/ed712/IAPIntro.html

Views of the Solar System
http://www.c3.lanl.gov:1331/c3/people/calvin/homepage.html

The Virtual Tourist
North America—http://wings.buffalo.edu/world/na.html
World—http://wings.buffalo.edu/world/
Europe—http://wings.buffalo.edu/world/europe.html

Mexico WWW Servers
http://info.pue.udlap.mx/www-mex-eng.html

Journey North to the Arctic
http://ics.soe.umich.edu/ed712/IAPIntro.html

Tourist Expedition to Antarctica
http://http2.sils.umich.edu/~amber/Antarctica/Story.html

ArtServe
http://rubens.anu.edu.au/

Journey North to the Arctic (Inuit)
http://ics.soe.umich.edu/ed712/IAPIntro.html

World Cup USA '94
http://mirach.cs.buffalo.edu/~khoub-s/WC94.html

School District Home Pages

Virginia L. Murray Elementary School
http://curry.edschool.virginia.edu/murray/

Grand River Elementary School
http://web.cal.msu.edu/JSRI/GR/grintro.html

Electric Lincoln Elementary
http://indy.radiology.uiowa.edu/

Buckman School
http://davinci.vancouver.wsu.edu/buckman/aboutbuckman.html

Hillside Elementary School
http://hillside.coled.umn.edu/

Pride Web
http://indy.inre.asu.edu/~sam/pride-home.html

Internet Project
Internet Activities and Ideas for Teachers

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Key words: Internet, curriculum, instruction, problem-solving

Abstract

The Internet provides a wealth of information for educators. Teachers and students can search for resources in many major international libraries, obtain up-to-the-minute weather data and images, send messages to the president of the United States, and interact with people in more than fifty different countries. A major stumbling block for the integration of the Internet into education has been the tremendous amount of time required to explore the vast network and locate appropriate resources.

To provide assistance to educators, the Florida Center for Instructional Technology (FCIT) at the University of South Florida has developed a series of instructional activities and ideas that target the Internet. For example, quick reference guides were produced for some of the major educational resources, such as AskERIC, NEWTON, NASA Spacelink, and Weather Underground. These guides provide the Telnet addresses, the sign-on and sign-off procedures, an overview of the system, and the major menu options. Specific educational activities with step-by-step procedures are included for each resource, as well as supplemental curriculum integration ideas.

Another FCIT initiative included the development of educational activities designed to encourage the exploration of the Internet. These activities can be used for individual practice, class exercises, or as templates for students or teachers to create their own activities. One such activity is "To Catch a Thief." This exercise provides five clues to information "hidden" in NASA Spacelink and enlists the users to gather the data necessary to apprehend a fictitious thief. For example, one of the clues states: "The thief is old enough to solo an airplane." Students search in NASA Spacelink for the correct age, and the number then becomes one component of the final solution.

Another activity consists of a crossword puzzle that focuses on using the Educational Resources Information Center (ERIC) and on-line libraries. The students (or teachers) must use logical connectors and other retrieval techniques to answer such questions as "Where is the school located that trained USSR soccer players in the late 1970's and 1980's" and "In what year did the word CD-ROM first appear in an ERIC title?"

A third activity, "Where in the Internet is Carlos Sarasota?" requires access to the Library of Congress, AskERIC, NASA Spacelink, Georgia College EduNet, and the Weather Underground. This exercise includes clues to track Carlos's path through the Internet in order to locate his current hiding place. Each clue provides a number that becomes part of the ISBN number for the book that Carlos was last seen reading. After the ISBN number is derived from the clues, the participants determine the title of the book and its location.

The Internet activities have been extremely well -received by educators in Florida. Some teachers are using them as exercises for students; others review the activities themselves to become more familiar with the Internet. Telnet addresses, step-by-step procedures, and answers

are given for each exercise to provide reinforcement and instruction. This presentation will address the need for the project, as well as the design, development, and dissemination of the activities. Participants will receive copies of all activities.

Demonstration

Simulation Programs for Training Florida Teachers to Use Telecommunications

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Key words: simulation, training, networks

Abstract

In order to link all of the public educational systems in Florida electronically, the Florida Legislature established the Florida Information Resource Network (FIRN). This telecommunications network connects computer resources at universities, community colleges, and school districts. Teachers and administrators can access the network via an electronic mail system, called FIRNMAIL. Through FIRN and FIRNMAIL, all educators have free access to a wide variety of computing resources and services.

Several technical personnel are located throughout the state to provide inservice training sessions on how to use the electronic mail system. Most of the training sessions take place in local schools. In such settings, it is nearly impossible to provide hands-on training for the participants because few schools have more than one or two telephone access lines.

The need for a vehicle to train educators to use electronic mail led to the development of computer-based simulations. The simulation programs were designed and developed by the Florida Center for Instructional Technology at the University of South Florida. Two versions were created—one for the Macintosh environment and one for MS-DOS.

The simulations provide guided practice for the most common functions of FIRNMAIL. Students can emulate the keystrokes and procedures required to create, send, read, index, and delete messages. This presentation will include demonstrations of both versions of the simulations.

Demonstration
The Critical Role of Mapping Software in Student Collaborative Investigations

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Key words: mapping software, network science, collaborative investigations, GIS

Abstract

Increasingly, telecommunications is being used for students to participate in international collaborative investigations (network science). These network-based investigations, in which students share local environmental observations with other students throughout the world, have tremendous potential to help students learn. Experience has shown that mapping software (enabling students to display and analyze their data on computerized maps) is a critical element in the success of these student collaborative investigations. Mapping software enables the students to visualize the data and identify geographical patterns in ways that would otherwise not be possible. This session will demonstrate TERC's Alice Network Software and ESRI's ArcView as important illustrative examples of two broad domains of mapping software for education. In addition, a copy of the proceedings from the First National Conference on the Educational Applications of Geographic Information Systems will be distributed.

Network Science—Student Ozone Network As an Example

We begin with a practical example. Students in a select group of schools throughout the world are using a new low-cost device to measure stratospheric ozone (TERC's Total Column Ozonometer). The data from their daily observations are of tremendous value, not only for their own learning but also for atmospheric scientists ,who very much want data from a broad range of locations.

Both groups use telecommunications to share their data and mapping software to display and analyze it. The students use the Alice network software, which is optimized for students (and will be demonstrated later). The scientists use tools such as ArcView, which have more sophisticated mapping capabilities. In both cases, the key is to consolidate the worldwide observations and then use the mapping software for visualizing the data.

Alice Network Software—Combining Telecommunications with Mapping
Let's first take a look at the Alice software. Alice was developed by TERC, under a grant from the National Science Foundation, as a tool to support student collaborative investigations. All of these investigations (the ozone project is just one example) have several key elements:

- students investigate real world problems
- students collect data using instruments and/or direct observation
- they enter the data into their computer and send it to a central database
- data from all the reporting stations are consolidated and sent to the schools
- the students use the software to display and analyze the data
- the students learn a lot, make amazing discoveries, and solve the worlds problems (we hope)

The Alice network software is an integrated package, combining the data entry, telecommunications, mapping, and other tools into a single tool that is easy for students and teachers to use. Let me walk you through the process they used with the ozone project:

demonstration of ....
data entry
telecommunications to send the school's data
telecommunications to receive the consolidated data
data table to see the raw data

Now we get to the maps. This map shows the ozone reports in the continental U.S. Notice the range in values from (tba) to (tba). Let me explain what these values mean.

This report, for example, is from students in (tba). At noon on (tba), they pointed the TCO directly at the sun, like this *(demonstrate)*. As the sunlight goes from the sun to the TCO, it passes through the Earth's atmosphere, which acts as a filter, blocking out certain wavelengths of light (show chart). We are especially interested in ultraviolet (UV) light. If too much UV light reaches Earth, it can be dangerous, causing sunburn, increasing the chance of skin cancer, etc. One reason scientists are so concerned about the observed depletion of stratospheric ozone is that this ozone is our planet's primary UV filter—less ozone, more UV, and hence more danger. The TCO works by measuring the amount of light passing through the atmosphere (that is, through the total column of atmosphere between the TCO and the sun) at certain frequencies in the ultraviolet range. The students then use some empirically derived formula to translate these wavelength readings into a estimate (±15%) of the amount of ozone.

In the case of (tba), the ozone measurement was (tba) whereas in (tba) the measurement was considerably less (tba). Let's examine other reports. I have made copies of a printout of this map of student reports. The map comes directly from the Alice software and shows the full set of student ozone data on (tba).

ArcView—A Commercial Geographic Information System (GIS)
Now let's use a different mapping software package to analyze the data further. While the Alice software has the ability to display the data, it does not (yet) do contouring, which is what you just did manually. I've taken this same data and imported it into ArcView, a commercial GIS package from ESRI. GIS stands for "Geographic Information Systems, "that is, computer software that supports mapping of data and its spatial analysis. GIS is actually a billion-dollar-a-

year industry, and growing. There are major GIS appl: :tions in government, research science, marketing, and so on. ArcView is one of the industry standards.

Let's take a closer look at ArcView. As you can see, ArcView has tremendous capabilities for visualizing and analyzing the data. However, it is not (yet) especially easy for neophytes to use. It was designed for commercial applications, although an increasing number of educators are experimenting with ArcView in the classroom.

Comparing Alice and ArcView

Let's consider the relative merits of Alice versus those of ArcView. Then I would like to give you some practical suggestions on how you can use these (and other) mapping tools in your classes.

Alice is designed specifically for use by students. TERC has a lot of experience with student collaborative investigations. If you recall our discussion at the beginning of this session, student collaborative investigations (which we call Network Science) have the following key elements:

- students investigate real world problems
- students collect data using instruments and/or direct observation
- they enter the data into their computer, and send it to a central data base
- data from all the reporting stations are consolidated and sent to the schools
- the students use the software to display and analyze the data
- the students learn a lot, make amazing discoveries and solve the world's problems (we hope)

In TERC's NGS Kids Network unit on acid rain (used by thousands of classrooms every year), elementary school students measure the acidity of their local rain, share these data with other students throughout the world, and use a precursor of the current Alice software to display and analyze their data on maps. As another example, TERC's Global Lab engages high school students in investigations of local ecosystems and environmental problems—using Alice to share and analyze their data with other students worldwide. The TCO data, in fact, come from the Global Lab project.

TERC designed Alice to have all of these pieces in one integrated package that is easy for students and teachers to use. Data submission is automated. Data consolidation takes place at a central hub, without the students themselves having to merge the data. And the data automatically feed into the mapping displays. The maps enable you to display the data in actual values or other symbols, zoom in to particular regions, scroll to other areas, and look at selected geographic features likes rivers and boundaries. And all of this is very easy to do—it is optimized for kids.

On the other hand, ArcView has more sophisticated mapping and analysis features. It can present multiple data types on a single map (data layers). It can draw contours to help you visualize the data better. And it can integrate multiple data bases, including both student data and commercial data. Remember, though, that it has no telecommunications capabilities. Your students would need to use a separate telecommunications package and some sort of data consolidation system to share their own data.

Perhaps the best classroom situation is to use a combination of the two packages. Use Alice to share the student data and for most of the data analysis. The bulk of the analysis, including graphs and maps, can be done very effectively with Alice. However, if you need to do more sophisticated displays, or if you want to link the student data with commercial data, then export the data to ArcView (we are working on an option to export Alice data in standard ArcView format). For most regions of the country, you can also get sizable amounts of local data (housing, population, utilities, ecosystems, etc.), which can be correlated with the domains of your student investigations.

Benefits for Students

There are many benefits of network science, and the using of mapping software, for students:

First, the whole concept of student collaborative investigations has tremendous power:

- Students are engaged in real-world investigations. They're learning not from textbooks but from hands-on investigations.
- They learn how to collaborate with students in other schools. Real scientists are increasingly using telecommunications and the sharing of data for their own investigations.
- They use telecommunications for more than just e-mail. The data they share have important, practical applications.
- They work in an integrated context, combining science, math, language, and social studies.
- They develop a broad range of thinking skills.

Second, the use of mapping software extends the power of network science dramatically:

- Students learn much more about the data through map-based visualizations.
- Student develop powerful data analysis skills, helping them to find meaning in the data.
- They remember the information better when they learn it in a visual context.
- They can correlate their data with geographic features, helping them to better understand some of reasons for the patterns that they observe.

Third, GIS, in addition to being a very effective way to learn, offers significant career opportunities for the students. GIS is a rapidly growing field, with current and emerging applications in earth science, biology, social sciences, geography, government, and numerous other domains. Students with experience in GIS will have career advantages.

First National Conference on GIS in Education

I would like to conclude this session by distributing copies of the proceedings of the First National Conference on the Educational Applications of GIS. This conference, which was funded by the National Science Foundation and implemented by TERC, brought together experts in GIS, education, and the cognitive sciences to share the current state of the art in this field and to explore potential new directions for the future. The proceedings include copies of the papers presented, as well as recommendations and suggested resources. I think you will find it to be a valuable resource as you consider expanding your use of mapping and other GIS software in your classes.

Policy

From Seven to Seven Thousand in a Year: Reasons and Solutions

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Key words: computer conferencing, teacher education, electronic networking

Abstract

The Education Network of Ontario, a UNIX-based, cross-platform, TCP/IP, electronic mail, conferencing and database system, fully operational in English and in French, was started in early 1993 to assist K/12 educators in implementing vast changes in educational policies and practices. Within sixteen months the number of registrants had risen to ten thousand because there were few barriers and a great need for such connectivity in the province.

In order to serve the numbers of users, the project has expanded to include administrators, trustees and education officials of the government. Equipment is being deployed throughout the province to allow users direct access without long distance costs and to enhance local networking and data transfer initiatives. Although the emphasis has been on creating affordable network access for all educators, the atmosphere of cooperation created through the implementation of this solution will foster interface development and creative new applications.

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Introduction

The Education Network of Ontario is a newly consolidated project encompassing all of the principal stakeholders in the K/12 education community—teachers, administrators, trustees, and government. It is a natural outgrowth of a UNIX-based, TCP/IP, cross-platform, English and French, electronic mail and conferencing system begun in early 1993. This networking initiative was funded as part of a more complex project to assist teachers in their understanding and implementation of government-mandated programs and policies of educational reform.

A Successful Launch

Teachers from elementary as well as secondary schools, women and men, with computer training and experience and without, in English and in French deluged the system with registrations, on-line time, and needs requests for technological assistance. The number of users rose to over ten thousand, or nearly 10 percent of the available teachers, in just sixteen months for a series of reasons.

- The reform required by the government was so profound that teacher, student, and community anxiety was incredibly high. Student streaming, begun half a generation ago, was to stop abruptly, subject orientation would be diminished, and students and schools would be reorganized into cohort groupings with smaller, more stable teacher groups.

- Government budget constraints and downsizing obviated the development of the kinds of concrete, prescriptive guidelines for teachers and schools that had been past practice. In their place are abstract outlines long on philosophy and short on concrete suggestions for timed implementation.

- The networking initiative is staffed with a nucleus of classroom teachers who assist teachers new to the technology as colleagues rather than as experts. They act as on-line moderators who open and moderate conferences of interest to other classroom teachers, access and gather useful resources, attach and transfer files, and give workshops in their local communities.

- This open system uses all platforms—Intel-based, Macintosh, and UNIX—available and interchangeable at the switch of environment keys. It is fully functional in English and/or in French and is available from home and cottage as well as at school. All accented characters are retained, transmitted, and properly sorted and indexed from all sources, inside or outside of the network.

- The software development cycle is very responsive to teachers' needs. One conference, moderated by a technician, is devoted to teacher input about the direction, timing and design of enhancements.

- The network has attracted the interest of the educational departments of various government divisions and agencies and nonprofit organizations as their way of becoming more informed about pedagogical and curricular issues of true interest to teachers and as a means of creating test groups for new initiatives.

- Ontario teachers are extremely well educated, and they pursue personal and professional activities consistently and of their own volition.

All of these factors translate into teachers who are sufficiently motivated to risk a new technology and to spend their own time to assist one another in developing professional dialogues, which brings them onto the system regularly enough to make it a part of their professional lives and begin to affect practice.

Choking on Our Own Success

The heavy use of the system quickly outstripped the ability of the equipment to perform and threatened to outstrip the logic of government funding for packet switching and 800 lines, since by far the greatest proportion of users were from outside the major municipality of the province. The Ontario Teachers' Federation, architect and administrator of the project, realized that all stakeholders would need to be involved to assist with solutions, so project workers developed partnerships with senior administrators (directors and superintendents), trustees (the elected officials for school regions), and government officials.

The Technical Solution

This new alliance is actively involved in establishing a working, accessible, affordable network for all of the K/12 educators of the province. Because the Ministry of Education is involved and can now imagine that many of its needs can be met by such a widely distributed, active user base (teachers), money is starting to flow to deploy file servers to regional areas to allow users direct dial access from home or school. Since file servers are placed in the most active and expensive areas first, the project's costs are rapidly reduced.

The high-speed lines connecting the servers are government lines, so reduced rates are possible and full Internet access can be supplied as a part of the service without greatly increasing costs. Even the modem lines are being supplied to the project at government rates rather than the tightly-regulated business rates of the past.

Positive Effects

These file servers are being installed in educational offices throughout the province with connectivity needs of their own for the transmission of data and summary reports. This is occurring in an environment of reciprocal needs, using ministry-developed and, updated software. High-speed lines are now being shared between these constituencies and the project in these regions, with reduced costs to all. In fact, the process by which the file server locations are developed is a very positive one. An area is invited to nominate itself for a file server. Before a project worker arrives in an area, meetings are held to establish a cooperative committee of regional school boards, with representation by a wide variety of educators and support workers.

Cooperative links are being established between competitive factions such as boards of education and between board business divisions and classroom educators, since all require connectivity for board or classroom. This will result in shared applications, knowledge, and interfaces with reduced costs and wider connectivity.

The Ministry of Education's technological initiatives are again focused on the users, the teachers and students because of the large involvement of teachers before the ministry became enmeshed in network development. After technical problems are smoothed out, interface and new application development will become the next priority of the organizations involved. Because the Ministry of Education must purchase technical services from the same government agency and many other ministries, shared software and applications development may become a norm rather than an unusual event. There could even be reduced funding overlaps with other ministries.

Teachers were the first to benefit from the initiative because their professionalism and enthusiasm were the keys to the project's success. There is a true sense of partnership at present with the administrators, the trustees, and the government. The needs of the students and the classroom will be impossible to ignore.

Demonstration
Electronic Page-Turners: Network Publications as On-line Magazines

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Key words: archives, design, format, Gopher, publishing

Abstract

Many computer users find themselves managing on-line information collections, including bulletin boards, Gopher servers, and shared hard drives. Well-designed on-line collections function like magazines, organizing information for particular audiences and guiding readers to items of interest. As an on-line editor, you should keep in mind the following tips to help you best serve your readers:

- *Know your audience. Understand not only what information people need, but how they need to receive it. For example an archive designed for browsing by Mosaic won't be much use to classrooms equipped with old Apple II or IBM-XT computers.*

- *Post appropriate content. A shared System 7 hard drive dedicated to desktop publishing resources shouldn't contain (or at least shouldn't share) personal correspondence and other distracting material.*

- *Format for readability. Understand how your archive will appear to others on the network. Provide navigation tools such as ordered directories, "About . . ." files, and local search software.*

- *Format for access and portability. If you want readers to access your "magazine" as an FTP archive, make sure that your file names will make sense in FTP commands and that the files will be in formats that computers can download and convert in common applications.*

- *Publish quality. Be selective about what you upload. Not only should your information be easy to find, read, and manipulate, it should also be interesting, useful, fair, and true.*

Remote/Distance Education

Teaching K-12 Teachers to Use the Internet: What Works

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Key words: Internet, training, K-12, staff development

Abstract

As the Internet has become more accessible to teachers, the demand for training has skyrocketed. This paper describes three training models that have been successful in the collaborative efforts of a school district and a university to bring a large number of K-12 teachers on-line. The first model involves intensive training and orientation. The second model involves shorter, more focused sessions offered on an ongoing basis. The third model combines the first two models for the optimum training arrangement.

The Context

The Boulder Valley School District in Boulder, Colorado, has undertaken a collaborative project with the University of Colorado at Boulder to support Internet access for faculty, staff, and students throughout the district (47 schools, 36,000 students and approximately 1,600 staff). In a nutshell, the goals of the project are to investigate how teachers and students will use the network resources, what changes it catalyzes, what support is needed, and how teaching and learning are affected. In addition to university and school district funding and support, the project is funded by the National Science Foundation, the Annenberg/CPB Project for Math and Science Education, and the US West Foundation. The project has been under way for two years, during which time we have learned valuable lessons in staff development.

The Models

In the Boulder Valley project, our baseline goal in every Internet training workshop is to demonstrate the resources of the network and enable people to go home and begin (or continue) exploring the network on their own. To accomplish this, we use one of two models, or in ideal situations, a combination of the two. The first training model is the "power workshop" and the second is the "progressive workshop." These workshops are different from the very frequent "Demonstration" or "Introduction" type of presentations which are not hands-on and may be twenty minutes to an hour in length.

In the power workshop the group generally meets together for at least one day and as many as several consecutive days. The power workshop meets the needs of those who want to find out more about the network. It enables them to see what is there and decide if it is worth their time and energy. Because we supply good documentation for people to take home, this workshop also meets the needs of those who want to learn how to use the network. After this workshop participants know what the Net has to offer and they can go home and explore whichever function they want—be it via Gopher, World Wide Web, or e-mail.

The key to making the power workshop successful for both the participants and the trainers is to provide documentation that is incredibly detailed and thorough—right down to the last return! This serves two purposes. First, there will be many fewer "How do I . . .?" questions during the hands-on portions of the workshop. Since there are invariably technical hitches and unavoidable questions, the fewer questions about "how" this is done, the less time participants will have to wait for help when they need it (and the less stressed the trainer will feel!). Second, if participants feel they have a concise "how-to" document, they will be more likely to try out their new skills at home.

At the conclusion of this workshop people are almost always overwhelmed—they have had a true Internet experience! Being overwhelmed is not necessarily a desirable outcome, and it is the drawback of this type of workshop. However, it is difficult to give a good overview of the network without overwhelming people. Happily, most people are overwhelmed by all the "good stuff" they see out there as well as by the potential of the tool; the vast majority of teachers are very enthusiastic. Evaluation comments often state that this type of workshop was the most "informative" and "valuable" the teacher has ever attended. Those people who do not have a positive workshop experience often comment that the technology is too complicated or intimidating. Often these are people who have not been willing to work with a partner or who do not read the step-by-step instructions during hands-on exercises. They tend to end up in some far-off corner of Unixland.

The second training paradigm, the progressive workshop, is spread out over time and gives participants the opportunity to go home each week and practice their new skills. In Boulder Valley these progressive workshops begin in mid-September and continue through May at the rate of three to five a month. The workshops are held after school for one and a half hours. This format allows much more in-depth work on many diverse topics, and participants know that if they go home and try to use the network they have someone to turn to for guidance and support.

This type of workshop can be done in a relatively short period of time: once a week for six weeks. Alternatively, it can be spread out and done once or twice a month for an entire school year and cover any number of topics. If the workshop sessions are ongoing, participants can pick and choose which topics they wish to learn more about and can proceed to the next topic when they feel ready. This is an effective means of ongoing staff development for districtwide Internet training.

The ultimate model, if both time and funding allow, is to have a one-day (minimum) power workshop followed by a progressive workshop. This format capitalizes on the benefits of each model and minimizes the drawbacks. In the one-day workshop, people get an overview to begin with. In the progressive workshop they may choose the topics that appear to be most relevant to their specific needs. Participants know that the power workshop is a primer and that they will have an opportunity for both further instruction and support.

Because a specific set of circumstances accompanies each training venue, combining these two training models is often not possible. The two different models do address slightly different participant needs. The power workshop is more suited to the information seekers and the people who are not quite sure they want to be there in the first place. The progressive workshop is better suited to those who know they want to learn more and are ready to use the network .

Conclusion
Training teachers to use Internet resources has been an extremely rewarding venture. As a trainer you will enjoy facilitating the use of a tool that truly excites teachers and opens up whole new worlds of possibilities in the classroom.

Remote/Distance Education
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Key words: distance education, telecommunications, interactive video

Abstract

As in many states in the inter-mountain West, distance education has great potential to improve educational access. This is especially true in the state of New Mexico. New Mexico, the fifth largest state, encompasses 121,335 square miles. More than 32% of the state's population of 1.5 million is centered in the Albuquerque area. Outside of Albuquerque and other population centers, the population density approaches 3.0 people per square mile, and higher education delivery is difficult.

For the past decade the University of New Mexico has utilized video transmissions to provide university courses to areas of the state not comprehensively served by local higher education institutions. The presenters in this session will provide an overview of the distance education delivery systems operated by the University of New Mexico. These systems include a fiber network connecting UNM to New Mexico State University and New Mexico Tech University; eight channels of ITFS television servicing central and north central New Mexico, statewide compressed and full bandwidth video via satellite, interactive compressed video, and audio graphics. UNM serves as an Internet node, and there are a number of data interconnections available to support message transfer and database access for distance education programs.

William Bramble will provide an overview of the systems available at the university. Additional presentations will describe specific academic programs transmitted by the systems. Charlotte

Gunawardena, Assistant Professor of Education at UNM, will describe the use of an audio graphics system that provides graduate courses in instructional technology to students from the Los Alamos National Laboratory. Nasir Ahmed, Chairperson of the UNM Electrical and Computer Engineering Department, will describe a program that delivers graduate engineering, science, computer science, and mathematics courses to New Mexico's two national laboratories and to high-tech industries in the Albuquerque area. Dianna Shomaker, Associate Dean, UNM College of Nursing, will describe the statewide delivery by satellite of a Bachelor of Science in Nursing (BSN) completion program and a new Family Nurse Practitioner Master of Science degree program via compressed interactive video. Presenters will discuss lessons learned in operating the programs and their application to other settings.

Demonstration
SpecialNet Demonstration: New Network Features – GTE Educational Network Services (GTE ENS)

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Key words: electronic mail, on-line databases, conferencing, Internet access

Abstract

A brief demonstration of NEW features of GTE Educational Network Services (GTE ENS) will be shown. GTE ENS's new graphic user interface (GUI) software, new distance learning curriculum, full Internet access, as well as markedly lower prices, will be announced. Network conferencing (e.g., CHAT) can be demonstrated. Questions will be encouraged. Participants may win ONE GTE ENS subscription.

New Network Features

A representative of GTE Educational Network Services (GTE ENS) will present an "on-line" overview demonstration of SPECIALNET, an electronic telecommunication information network. The presentation will cover the network's capabilities and advantages to education, special education, health/human services, maternal/child health, government agencies, and related groups.

New special features will be briefly demonstrated. This session will cover the following but will be flexible, depending on audience participation and questions:

- using electronic mail and the NEW GRAPHIC USER INTERFACE software to communicate more efficiently and effectively

- accessing some of the more than sixty state and national bulletin boards covering an extensive range of topics and providing an invaluable resources

- demonstrating the NEW distance learning curriculum, CHAT, the network conferencing feature, as well as some of the more than electronic databases through searches. This provides a fast and cost-effective way of locating specific information contained anywhere in the text of a document.

- connecting to INTERNET via SPECIALNET and "browsing" (i.e., Gopher, World Wide Web [WWW], File Transfer Protocol [FTP], Wide Area Information Services [WAIS], and others)

Project

Telecomputing Projects by the Science Academy of Austin

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Key words: telecomputing projects, telementoring, interdisciplinary projects, HyperCard, supercomputing projects

Abstract

Four Internet-based projects are described. Project SECs (Students Exploring Cyberspace) is an interdisciplinary project in which students explore the social and biological implications of AIDS. In this project, students use the Internet to locate current information about AIDS and to interview students from other countries about their perceptions of AIDS. Students produce HyperCard stacks on AIDS that are used to teach junior high students about the disease.

Project SAGE (Science Academy Genome Exploration) is a data collection and telementoring project that focuses on the social and biological implications of the Human Genome Initiative. Students use the Internet to gather information about progress in the HGI and to communicate with scientists. Students "publish" articles and discuss their findings in newsgroups on the Internet.

HyperConcept is a multimedia development project for physiology. Physiology students work collaboratively to create a concept map of a given topic in the field of physiology. Pairs of students choose subtopics within that concept to research. They use Internet resources such as Gopher, Telnet, and FTP to research their subtopic and then they create HyperCard stacks incorporating text, animation, QuickTime movies, and graphics. These stacks are combined into a class stack on the concept and used to teach other high school students about physiology topics.

Wireman is a three-dimensional movie-making project utilizing the Cray. As part of a required ninth grade Science & Technology class, students learn to create 3-D movies on personal computers using Wireman software. They upload the wireframe files to the National Education Supercomputer at Lawrence Livermore National Laboratory in California, learning to use Telnet, FTP, and Kermit protocols. After remotely operating the Cray, the students download the 3-D movies to our PC's.

Internet Projects
Model Activities for Internet-Accessible Teachers

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Key words: telecommunications, curriculum, social sciences, Internet

Abstract

This presentation will show model activities for K-12 teachers who have access to the Internet. Some of the model activities include semester-long international projects such as the Air and Water Projects. These projects are curriculum-based and have been piloted for three years. Participants in these projects were from the United Kingdom, Australia, New Zealand, and the United States. Also included in this presentation will be project guidelines for starting a similar project in other schools. Topics such as finding participants and structuring projects with existing curriculum will be addressed.

Math/Science

EnviroNet: Network for Improvement of Environmental Science Education

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Key words: environmental science, environmental monitoring, Internet, K-12, network

Abstract

EnviroNet uses telecommunication's technology and the Internet to enhance environmental science learning in the K-12 community. Several monitoring projects have been established on the network that allow students to collect data locally and then share their results regionally on the Internet. This collaborative approach to environmental science education has led to many interesting research projects by participating schools. EnviroNet involves scientists, teachers, students, and environmental educators.

The EnviroNet Project

EnviroNet is a network of teachers, scientists, environmental educators, and others who utilize telecommunications to enhance environmental science education. EnviroNet began in 1992 as a Teacher Enhancement Project at Simmons College in Boston, funded by the National Science Foundation. The purpose of the project is to enhance environmental science education at the middle and secondary levels in New England through the use of telecommunications. Forty teachers from seven northeastern states have been directly involved in the first phase of the program, which has run from 1992 to 1994. The teachers have access to the Internet through Simmons College or other Internet academic institutions. They have received instruction on the use of the Internet, and they use the resulting EnviroNet network for such activities as scientific monitoring programs, the sharing of ideas and data, electronic newsletters, bulletin boards, and generally maintaining contact with one another as well as other educators around the world. Teachers not directly involved with EnviroNet also participate in the various monitoring projects and discussion programs. A guest log-in procedure allows non-EnviroNet teachers to access the EnviroNet bulletin boards at Simmons.

During Phase I of EnviroNet, several scientific monitoring projects were initiated by the EnviroNet teachers and became the main focus of the EnviroNet program. They include Acid Rain, RoadKill, Lichens as Bioindicators, BirdWatch, Ozone, and WhaleNet. Resource packets were developed by the teachers and distributed to all interested participants (both EnviroNet and non-EnviroNet teachers). In these monitoring projects, various environmental educators and scientists throughout New England have agreed to serve as on-line resources for EnviroNet teachers and students. Data on the specific environmental parameters are collected locally and then transmitted electronically to the Simmons VAX bulletin board system. The regional data can then be downloaded by anyone who has a computer and a modem. The beauty of this model is that it emphasizes student-directed scientific discovery of their local environment, which can then be integrated into a regional research project. Students are able to communicate with peers, scientists, and environmental educators throughout the region, based on a common concern about and interest in the environment. To date, more than 250 teachers have participated in EnviroNet projects, with an estimated involvement of thousands of students. The opinions of teachers and students are overwhelmingly positive.

In addition to the monitoring projects we also maintain "EnviroQuest," which involves an environmentally-related question posted to the EnviroQuest bulletin board. Interested teachers use the question as a teaching activity in their classes; class responses can subsequently be posted to the bulletin board. For example, one question involved the proposed reduction of the deer herd at the Quabbin Reservoir in western Massachusetts. Students were asked to comment upon the controversy surrounding this plan as part of an assignment on the increasing conflicts between humans and wildlife. This activity gives students an opportunity to see how people's opinions on such controversies can vary, depending on their community and background.

Beginning in the fall of 1994, Phase II of EnviroNet will continue the successful monitoring projects and will focus its attention on critical thinking skills, interdisciplinary applications, consistency of data acquisition, transfer and analysis, and increased variety of on-line scientific resources. We expect to establish an EnviroNet Gopher + server, which will increase awareness of and access to EnviroNet data. EnviroNet will also expand its efforts to increase the use of telecommunications technology by K-12 teachers through training workshops given by Phase I teachers. We will use a variety of mechanisms to increase the awareness of EnviroNet, including symposia, presentations at various science education meetings and posting on Internet listservs and Gophers. In addition EnviroNet has established a partnership with the Massachusetts Corporation for Educational Telecommunications (MCET) for the 1994-95 academic year. MCET has been recognized as one of the leading distance learning networks in the nation. Our partnership involves the broadcasting of 7.5 hours of live interactive television to school districts both here in Massachusetts and across the nation. More than 80% of Massachusetts school systems are members of MCET. This television programming will focus on teacher training with telecommunications as well as student interaction with our existing monitoring projects.

Paper

How Can We Assess Whether Computer Conferencing Assignments Achieve Student-Centered Goals?

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Key words: computer conferencing, computer-mediated communication, assessment, ESL students

Abstract

This paper looks at the benefits that are claimed to flow from students using computer conferencing for learning and writing. I found that there is certainly not unanimity that computer conferencing (and other networking activities) should be used for purposes of student-led learning; indeed, some activities maintained, if not strengthened, the teacher's control. I outline the particulars of the conferencing assignment that accounted for 25% of my students' final marks in a first-year university general education course. Then I report on the various ways I could establish that it helped their learning and writing. In this report I will focus on a small group of ESL students, since I was particularly concerned that they not be disadvantaged

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by my expectations. This paper, then is a report on the problems I had assessing the effectiveness of a student-centered computer-conferencing assignment.

Conflict between Teacher-Centered and Student-Centered Assignments
According to Moran, networked computers in the classroom will do much more than "help"—they will "transform":

> Computers become a vehicle for the social construction of knowledge. In our writing classrooms, this means that computers will drive us toward collaborative learning: a pedagogy liberatory in its aim (e.g., Friere, Schor, Giroux) and social in its processes (e.g., Bruffee, LeFevre, and Gere). It's a promise of a magical connection between new pedagogy and new technology. (1990, p. 194)

Yet when Moran looks critically at the three "computers and learning" anthologies he is reviewing, he finds that the authors' use of networking often reinforces the teacher-led learning (what Crowley [1990] calls "full-frontal teaching"). He also notes, "There is another sign that the social construction of knowledge is not a received truth: despite _Computers and Community's_ [one of the three anthologies] insistence that knowledge is socially constructed, the essays do not seem to have been written in knowledge of one another" (p. 195). (He suggests that a true collaborative approach would be for the authors to write together on a conferencing system; then the transcript could be edited, with individual authors taking responsibility for sections.) In my own reading on computer-mediated communication (CMC), I found another glaring example of teacher-centered use. Under a section "Software Structures in the Virtual Classroom," Hiltz and Turoff write:

> Question/response is the most frequently used. One or more questions for response by other conference members are contained in the main conference comment. The author of a question/response activity has many parameters that can be set to tailor the interaction. . . . Each person must answer before seeing the response of others. This is very important for making sure that each person can independently think through and enter his or her own ideas, without being influenced by responses made by others. (1993, p. 473)

To be fair to Hiltz and Turoff, they do talk about other activities that stress collaboration and interaction (electronic gradebook and quiz activities) but their focus in this section is certainly on activities that stress the "control" potential of computer technology. I begin with these examples of the less-than-ideal from my prospective use of computer networks, to stress that the collaborative computer model is far from being universally endorsed. I think this is important to note because students will be developing certain perceptions of the medium if the technology is still being used in "control" mode, and this in spite of our best efforts to use it in constructive ways, will influence the restricted way students interact on networks .[1] I mention this point now because it was a factor that I hadn't considered when I was setting up this computer-networked writing assignment and deciding how to evaluate its effectiveness. As I will discuss in this paper, it's just one of a number of issues that have caused me to beless sanguine that we can indeed establish whether technological writing "helps" students; there are so many variables to consider in assessing effects and so many factors that influence how students learn to write. (A good analysis of some of these factors is found in Entwistle, Entwistle, & Tait, 1993).

The Particulars of My Course's Student-Centered Conferencing-Based Assignment

Let me explain how I am using "networked computers in a writing environment." I am looking at this issue not by examining collaborative writing per se— that is, not from the experience of students working on the same document,— and not from the perspective of examining typical computer conferences[2] but by studying individually-written electronic journals that students share within their electronic conference group (usually five to a group). They are expected to comment on each other's work, without the intervention of their tutors. At the end of the year the students turn in what they judge to be their ten best journals; they are also asked to provide some overview, cohesion, or organizing principle to their entries. (This assignment is worth 25% of their final mark in a first-year York University social science course about computers and society. See Appendix A for copies of the information distributed to students about the journal assignment: one hard-copy sheet and two on-line communiqués.) I justified the set-up of the assignment, arguing that it meets the aims of the constructivists:

> Learners at an advanced level of knowledge acquisition should be exposed to more open learning environments [which] are case-based and situated in the realities of the external world. These environments should. . .require learners to interact with other learners in a process of social negotiation. (Jonassen, Mayes, & McAleese, 1993, p. 336)

Specifically, three aspects of the assignment are relevant to constructivist theory:

1. The students' writing topics are "situated in the realities of the external world": for example, one of the writing probes was the question "Are we justified in pirating software?"

2. By reading other students' journals, the students socially negotiate meaning; they will be exposed to different viewpoints that challenge their ideas. This part of the theory is best expressed by Vygotsky's idea of "reciprocal teaching."

3. And, last, having the students collect the journals and pull them together in some kind of framework is an attempt to make concrete for the students the constructivists' (and other cognitive scientists') view that knowledge resides in a web of interconnections (Bereiter, 1991, cited in Jonassen, Mayes, & McAleese, 1993). The ultimate goal is to engage students through informal writing.[3]

Does this peer environment actually foster such engagement? As I read through the transcripts of the students' conferences ,[4] I could confirm that the students were interacting/talking to each other.[5] (However, the issue of control comes up here, for as my guidelines indicate, the students were severely penalized if they didn't participate; the conferencing system recorded when they added to the topics. As moderator, I made the topics Read-only after a two-week period so that students couldn't add their journal and comments late. Thus the issue of level of engagement cannot be measured by the number of messages students sent each other.[6]

How to Assess Whether students Were "Listening"?

I know they were talking, but were they listening? That is, were their peers' comments influencing their own thought processes? (How will I know this?— I explain further in this paper that I did evolve a categorization scheme, but it now seems problematic.) Are the students learning "more/better" because the topics are relevant to them? (Again, how will I know?) Are students making connections at the end of this writing/learning process as reflected in their hard-copy journal compilation? (As I show later, I can look for obvious signs in terms of the presentation of their work.) Let me look at these questions in light of my preliminary examination of the conferences of the ESL students in my tutorial; these students are almost all Chinese-speaking.[7]

Relevancy of Topics

I assumed that the topics were "relevant", but that was challenged. In feedback provided in the last journal topic, Student 1 wrote: "Expand communication to whole class; share other topics other than assigned ones about ourselves, our cultures."[8] I also found that the difficulty of the topic was more a determinant of whether students engaged with the topic and with each other's ideas about the topic than "relevancy" was. Student 2 commented: "Let students pick their own topics; because sometimes I found that according to some harder and more boring topics, my group members would not send out any comments but just posted out our journals, which I think is not an aim of this conference." This observation was confirmed when I checked the transcripts: the topics with the least amount of interaction were on the more challenging topics. The momentum built up in the conferencing fell off when the students had difficult material.

(I will have to check to see whether this is true for the native-speaking groups as well.)

Challenging Their Ideas

Problems with my taxonomy

In a previous paper (Craven, in press), I looked at ESL students' experiences sharing and commenting on their work. (Last year, we did not have access to CoSy, so we set up "shared directory" space where students copied their journals and commented, via WordPerfect "balloons," on each other's work.) In that paper I set up a taxonomy of the kinds of comments students made to each others' journals.

Table 1 Taxonomy of Comments (Percentages are for one ESL group— 5 students, total 203 comments)

1. Social (7%)
2. Technical support/procedural knowledge (7%)
3. Content Analysis:
   3.1. Agree/neutral/praise reaction to content (22%)
   3.2. Elaborate content (29%)
   3.3. Ask a question about content (26%)
   3.4. Disagree with content (9%)

I argued that there is a continuum of cognitive "involvement" from agree to disagree with two stages in between: Agree—Elaborate—//—Question—Disagree. At the easiest level, the reader can merely "agree with" or "praise" the reader—these kinds of comments are safe and unchallenging. It takes more effort to agree and then to "elaborate" or extend the writer's comment. But more involvement yet is necessary if the reader is "questioning" the writer. As can be seen from Table 1, in one ESL group of five students, 51% of the comments were of the types "agree" or "elaborate." But of course, my taxonomy and my hypothesis of cognitive involvement ignore the influence that culture plays on the type of on-line comments that are made. Students made the following points:

Student 3: . . .On the other hand, the part about commenting or criticizing other people's work was not very good. I think Chinese people won't usually criticize someone directly. It would make them lose face. In these journal entries, I sometimes disagreed with what someone else said but there was no way I could tell them that. I find Canadians are very direct and just say what they think but I can't do that. I think this could be improved by having some way to send anonymous messages. . . perhaps each student could have a nickname. . .

Student 4: I will say that the people in our group always have same idea on the topic. Such as the topic on "man as machine". . .I will say that this is because we all come from Hong Kong. So we have same culture. Also, my group is not so active. This is because of the education system in Hong Kong. In Hong Kong we always be teach to remember and not think. That may be an effect that my group is so not active on posting. I think the next year, it is better to mix all the people difference culture and difference major in group that may have more difference idea.

Student 5: Don't use our names; I think I can write more freely (and critically) without names.

Students' Influencing Each Other?

If students were influenced by others, they would read journals of others (assuming they weren't the first) and then write theirs as a result of ideas they read. In my charting of the ESL students' on-line interactions, students almost without exception added their journals, and then commented on others.[9] Occasionally a student would read the journals first, but the content of this journal does not seem to be influenced by other students' ideas.

Student 6 claimed, "If I were stuck on a journal topic and didn't know what else to write, I would look at my group members ideas and respond to them." Actually, when examining the record of his interactions, I found that he didn't do this. Which brings up the issue of whether to trust the students' accounts of having been influenced by each other's ideas.

Many of them claimed, as did Student 7, that "it [writing on a conference] allows us to accept other's ideas instead of confining ourselves to our own standpoints. Besides, it also encourages critical thinking when we formulate our standpoints, or when we agree or disagree with other's standpoints." I could also present evidence of influence, if when organizing their topics for their hard-copy presentation, they include the ideas of others. This did happen, but only infrequently did the students then add "comments on the students' comments." Such a dialogue was an encouraging sign that the students were listening to each other.

Student 8 illustrates concretely how reading and writing back to another student helped her extend her knowledge: "The reason I choose this journal isn't that I think it is more 'interesting' than mine, instead I like the 'comment' part of this journal. Although Student X assumed wrongly that Turing was a computing language developed a long time ago, he did offer me a chance to know more about the language: if I didn't have to point out whether Raymond as correct or not, I will never read the preface of my _Turing Tutorial Guide_, and find out that Turing [the computer language] isn't that bad as I originally thought of. In other words, I did learn something from this journal."

Connections Made?

I saw some very interesting examples to present as evidence that students were pulling together their ideas in a creative end-of-year summation:

Student 9 prefaced his journals with "In the following ten articles, you will enter X's world. You will know something about X himself, something about X's way of thinking."

Student 10 set up his assignment like a newspaper, with columns and graphics; he inserted other students' comments as small news items and then added his "editorial" comments on their comments.

Student 11 wrote: "In all my journals, each topic is different but they share one common theme--fear of computer which is underlined in each journal. This fear became stronger in the last few journals." (Throughout the entries, he does indeed show that this has been an apparently undetected theme for him all year.)
Student 12 presented his journals in the format of an ancient manuscript with charred page edges. As well, he began with a graphic of all the topics and then he drew arrows between them to indicate their relationships. This last student's work was the most encouraging sign that the assignment "worked" on one level: he understood the notion of the web of interconnectedness. But at the other extreme, some students did nothing more than write up a Table of Contents and hand in their original journals. Slightly more involvement was shown by a number of students who commented on why they chose to include a particular entry, but these efforts were token, and did not reveal any sense of the interconnectedness of ideas.

Conclusion

More thought has to go into this assignment to see

1. if my assumptions about what works are valid
2. how to set up the assignment better so that more students profit
3. how better to evaluate the results. I look forward to input from conference attendees on these problems.

APPENDIX A: SOSC1080 INFORMATION PROVIDED FOR STUDENTS

A. Hard-copy

January 1994
Working with CoSy and Journals—M-L Craven

Two Conferences

Familiarize yourself with CoSy; you will be a member of two conferences: sosc1080 (for the whole class), and sosc1 (for 2 to 25). When you are logged into CoSy (see instructions available beside the Bondar printer), type "show" and you will see what your group number is. (There probably won't be any messages in any topics in your small group conference yet.) Read any messages from me in sosc1080 in the three topics. Please feel free to post to these topics throughout the term; I will be posting here regarding course information so it is your responsibility to read this conference regularly.

Journal Instructions

In the Tuesday's lecture you'll be given a journal topic—write a response to the question in MS Word—you will move that file into the appropriate "topic" in your group's "conference" (e.g., "jan10-14" in "sosc1").

Each journal topic is related to a weekly "topic." (I did not label the conference topic with the "journal question" because I do not know in advance what the journal topic will be.) Go to the right week and move your file into the topic space. DO THIS BY THURSDAY at 10 p.m. of that week. Then over the next week, go back into the topic and make comments on your groups' journals. (And make comments on the comments, etc.). When adding a journal entry use the "say" command; when commenting on a journal, use the "comment" command. By Friday of the following week (i.e., by Jan 21) the topic will be Read-only. (BTW, while your tutor can read the journal entries-- and will be keeping track of your participation--he/she will not be participating on-line; this is your space, and your opportunity to listen to each other without your tutor's intervention.)

Grading (worth 25% of final mark)

Weekly participation is required; if you fail to submit your journal entry OR to make comments on other student's journals, you could lose 15 of the 25 marks; sporadic failure to participate will result in a reduced mark (i.e., missing two weeks will result in a loss of 5 marks, 3 weeks-4 weeks a loss of 10 marks). If you regularly contribute you will start out with 25 marks.

At the end of the term, you will self-select 10 journal entries (including those from first term if you wish) that you want evaluated. You will organize these journals in whatever way you want, and you may include responses from the conferencing interactions, as well as follow-ups to original journal entries. Try to be creative in the way you present these journals. We will be looking for the posing of interesting questions and thoughtful responses to issues raised on-line and in lectures. (Just throwing ten journals together at the end of the year will not get you a good mark.)

B. Information distributed on-line via collective conferencing group

Handed-in Journals

Instructions regarding Journals

When your last assignment is complete, look over your journals and pick 10 of the most interesting journal entries. If you want to add one NEW journal entry, on a topic of your choice, then just pick 9 from your "published" work. You may also want to include some responses you gave to your group members' journals—if they ended up being more interesting than your original posted journal.

Arrange them—be creative given our technology—and provide some kind of overview of what the reader is going to read. Remember that while your tutor may have "eavesdropped" on your journal entries, he/she has not had a concentrated look at your ideas. You may want to annotate your journals—perhaps updating some ideas—admitting that you may have now changed your mind about something you said in January.

In other words, there is NO prescribed format for these journals—unlike the very clear instructions for APA-formatted research papers. This is an opportunity to express your individuality, but remember the focus should be on the presentation of "your intellectual ideas." We will have the scanner working soon, so if you want to add graphics and pictures to your journal record go ahead! (Just remember to credit the source of the graphic.)

Please go over the entries with a spell checker, and go over the Sentence Pattern Sheet to make sure you don't mangle your punctuation. . ..

Turn the journals in by Wed. APRIL 13 (this is the last day to turn in term work; turning in earlier is always welcome!) Stephen, Patrick and I will let you know how you can hand in the journals and get them back.

Remember: If you did not regularly write your journal entries and comment on others, your journal assignment will not be marked out of the possible 25 marks. I refer you to my earlier information about marks being deducted for non-participation.
*****

TITLE: LAST journal!

In this journal topic, please be as objective as possible--provide CONSTRUCTIVE feedback about this course assignment. The intent of this assignment was to encourage you to do "exploratory thinking" in an informal manner. So think about these questions:

Was it worthwhile?
Was the medium --A fairly rudimentary conferencing system at that--robust enough to allow you to communicate with your group members? Did you learn from writing down your informal thoughts? Did you learn from reading each other's reactions to each other's ideas? What could you suggest to make journal writing/conferencing work better? Any other info you want to add. . .. (thanks for ALL input--this is the first year that we've used a REAL conferencing system in this course, so we need feedback. . ...)

Endnotes

1. Salomon's (1983) research confirms that a learner's attitude toward a medium influences learning. This attitude goes beyond the aptitude of the learner, the learning task, and the learning context that determines the learning outcome.

2. I would argue that computer conferences can function like Bulletin Board Systems where the users' "shoot from the hip" writing style runs counter to the contemplative atmosphere necessary for "writing to learn."

3. This type of writing is "expressive" (process writing that provides for the jotting down of ideas) as opposed to transactional writing (the traditional argumentative essays where teachers evaluate the finished product) (Craven, in press).

4. They signed consent forms giving me permission to use their on-line work for my research.

5. This year there were 31 groups with 12 topics in each conference; thus, I have plenty of data to process.

6. This level of participation is also dependent on access to machines, ease of software, workload in other courses, etc. Some of the ESL students did report that they felt constrained by the software and by dial-in problems. Reporting in Mindweave on the results of their Open University course, the authors found that only 1/3 participated on-line (the limiting factors were: the "creaky" software," only one-third had free access to workstations at all times, and one-third had to pay long-distance charges for the time on-line (Moran, 1990, p. 195).

7. The students attend the same lectures, but they have a "sheltered" two-hour seminar with me. I find that in spite of all my best efforts, I do most of the talking, expanding on and questioning them on their understanding of the lecture and reading material. There is little time for them to talk among themselves. When I examined the interactions in the three ESL conference groups, not all students commented at the same rate, but they did not favor one or two students over the others. What I found out at the end of the year was that in spite of the conferencing possibilities and their e-mail possibilities, a number of them used the oldest, most articulate student as their unofficial T.A.; he told me that he was frequently consulted by phone (and presumably in their native language, Cantonese) about the journal assignments and the readings. This "underground" student-led academic environment is one we should not forget about when we are assessing learning.

8. Students' writing has not been edited.
9. As reported in Craven (in press) this was not the case with the native-speakers' journals. They frequently wrote their journals referring specifically to "so and so's ideas" and, usually, arguing with that point of view. ESL students' disagreement, when they did disagree, was voiced in a stand-alone comment.

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Space Age Application
Ozone Odyssey

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Abstract

In April of this year, fourth, fifth, and sixth grade students from Hilltop Elementary School in Beachwood, Ohio, participated in a seven-hour space simulation, the mission, to repair the earth's damaged ozone layer. "Ozone Odyssey" was a culmination of efforts among school, community, business partnerships, and the National Public Telecomputing Network's Academy One.

This project began in the fall when a grant was written to the Rouse Company, the parent company of Hilltop's business partner. From that grant request, Hilltop School was awarded $6,000 to conduct the simulation at the city's main mall. The money was used to purchase computer equipment, audiovisual equipment, and materials used to build the simulator. Beachwood Place also solicited donations from local businesses, which included the plywood for the construction, the PVC piping that served as a superstructure, car seats, lights, and all the button and knobs that were used to maneuver and operate the simulator. Ozone Odyssey, the simulator, was designed by a local architect and built by volunteers.

Each of the school's 325 students made a contribution to the simulation, which was held at Beachwood Place, the local shopping mall. Six student astronauts manned the Ozone Odyssey craft. Their jobs included: commander, pilot and co-pilot, flight surgeon, scientist, and communications officer. An additional fifteen students participated as Mission Control specialists, with responsibilities that included communications specialists, video technicians, and ground crew operators. Ten students were mission scientists, conducting the same experiments on earth as were done in the anti-gravity of space. Data from these experiments were exchanged and compared. In the weeks before the mission fifteen students acted as flight trainers, simulating the training program that astronauts participate in prior to NASA missions. Classroom teachers took part in the simulation by having their classes participate in curriculum -related activities with a "space" twist. For instance, one class acted as meteorologists, building a weather station, from which they monitored and reported weather conditions throughout the mission. One class studying electricity created circuits inside robots, allowing them to actually move. A class studying nutrition compared the nutritional needs of humans on earth with the needs of astronauts in space. They prepared the meals for the astronauts and dried fruits and vegetables, which served as snacks during the mission. Colonization was studied in one class, and these students created a space colony. They were assisted by another class who studied space law and together the classes created a government for the colony. One fifth-grade class studying plant growth extended their studies to hydroponics. Several classes wrote stories and poetry with a space theme. All of the projects were then placed on display the day of the mission, and the students shared what they had

learned with visitors to the mall. IBM and NASA sent representatives to the mall to set up displays and discuss their companies' contributions to space exploration.

Using Academy One's NESPUT program, students were able to communicate via telecommunications with other students around the world. Schools in Florida, Texas, California, Ohio, and Brazil acted as alternate landing sights and solar flare observatories. One school in Germany provided a European News Service, taking our posted reports, and translating them into German so that the students monitoring the simulation on the Erlengen Free-Net could understand what we were reporting. Another school in Finland exchanged information on their own mission, which took place the same time as ours.

On the day of the mission a number of guest speakers joined the students and mall visitors for the opening and closing ceremonies. These dignitaries included school board members, school administrators, the mayor of the City of Beachwood, and state senator and former astronaut John Glenn.

In our presentation we will discuss how the planning and organization for this tremendous project took place. We will share ideas and make suggestions as to how other educators can make a program happen in their school, soliciting building-wide participation. We will show participants how an entire community, working together, can create a valuable and memorable experience for students and residents alike, using telecommunications as the basis for the project.

Project
Network Links Between School Students and Adults Other Than Teachers

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Abstract

Network classroom practice of computer communication links with other classrooms is becoming widespread. Much less widespread are network classroom links with individuals, agencies, and environments other than schools. This paper seeks to focus upon the role of computer communication networks to make communities more accessible and hence visible to young people, so developing the ground for broader perspectives of associated living to be explored and tested by them.

Paper Summary

A rationale with examples for computer communication networks to be used to link school students with adults other than teachers. Computer supported communications between schools and other network users have been gradually gaining momentum in the UK since the mid-eighties. However, most of the communication that schools have involved themselves in has been with other schools or with the advisory service.

The talk will reference examples of actual and proposed interactive network links between school students and adults other than teachers (AOTs), in environments in which they can be found. Particular reference will be made to the setting up of a community network in Milton Keynes, a new town 55 miles north of London, where the focus is on planning for school network links with local organizations.

Internal to these organizations are decision-making processes that represent an authentic educational resource for student insight and participation. The statistical data that are used in many cases to inform decision processes which are taking place are becoming more and more frequently available in the classroom. It follows that the criteria and constraints that are chosen in the environments where decisions are being made also need to be made available to students, especially where students can contribute to studies and make their own recommendations.

Developing interactive network links with the community by nature fosters inclusivity and identity within that community. Patterns of identity in an information age purport to be different from those of society's industrial predecessor. Schools, however much they might have been seen as institutions for emancipation, in the past mirrored the fairly vigorous requirements of stratification of the outside world (Young, 1989). Identity has up until very recently been a function of a world of work where class and community have been close associates. Young people frequently experienced rigorous indoctrination into communities of expectation. The demise of these communities has happened in a remarkably short time. Initiation by indoctrination has yet to be replaced by initiation by education into the community and the adult world. Previous to its decline, a more intact industrial culture had a wealth of cultural resources at its disposal. Put another way, it might be said that there has been an accelerating disintegration of the sophisticated fabric of determinism. Success with initiation in its absence can be assured only if there is a recognizable consistency in the fabric that attempts to take its place. The maintenance of such a necessary fabric requires a greater integrity in the adult world as perceived by the child. The sometimes overriding expediency of the marketplace, with its tendency to itemize in terms of market value, is not always commensurate with determining or safeguarding a wider array of community values.

Responsibilities in an information age require a higher and deeper awareness of associated living. Autonomy, so much a cherished attribute of enterprise culture, is founded on dependence. Network connectivity offers a medium to allow a more sophisticated view of this relation.

There have been few initiatives as yet which have set out to address electronic network links between school and community. Where links have been made, there has been little dissemination of reflections on their impact on the classroom, on pedagogy, and on learning.

Teacher Training

On-line Learning in Teacher Education

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Key words: teacher education, on-line learning, computer conferencing, professional development

Abstract

This session follows up on "The Reflective Community: On-line Links Shape Collaboration in Teacher Education," which was presented at Tel•Ed '93. It reports on the work currently under way in the Faculty of Education at York University in Toronto. During the 1993-94 academic session, the faculty began a three-year program to bring all student teachers on-line in a computer-conferencing environment. The primary purposes of this initiative are to:

- *promote reflection through asynchronous, written interaction*
- *involve student teachers in "virtual practicum" placements in educational on-line projects (e.g., Writers In Electronic Residence, local BBS-based projects)*
- *link with student teachers in other settings and countries (Japan, Iceland; PreSTO!)*
- *foster a sense of community among the student teachers, including interested others (e.g., sponsor teachers, faculty members, etc.)*

The program is undertaken on Current Practice, the on-line learning network of York's Faculty of Education. The network has been established to bring on-line learning opportunities to the pre- and inservice programs of the faculty, as well as to undergraduate and graduate level programs. Given the strong relationship between the faculty and the teaching profession, Current Practice is of interest to teachers and school boards who want to establish and operate on-line learning programs with strong links to teacher education.

Project-driven
A key element of the faculty's approach is that it is driven by projects rather than by the availability of technology, providing an on-line home for specific initiatives, ranging from curricular projects and coursework to an open forum for discussion within the faculty in an effort to inform teaching practice in on-line learning programs. Current examples include the use and impact of conferencing in course-specific and open-access projects:

- *preservice courses on-line*
- *open "edforum" conference (student-moderated)*
- *virtual practicum placements*
- *national literacy programs*
- *Writers in Electronic Residence*

Our hope is to develop a self-sustaining model for professional discussion and to build links to the emerging on-line learning communities in sponsor schools.

Paper
Collaborative Electronic Network Building

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Key words: teacher education, telecommunications, community-building, research, design

Abstract
This paper examines the process of teacher community-building by designing a telecommunications network with users. TERC's LabNet telecommunications network serves as a case study for exploring diverse modes of incorporating user participation. This paper addresses a series of research questions that are related to purposeful collaboration as a mechanism for successful teacher professional development.

Introduction

The idea that collaboration among teachers fosters community-building is not new. In the domain of education, there are a few strands of research that discuss the design and structure of cooperative educational learning experiences using telecommunications as a tool to enhance learning, particularly in teacher education and professional development (Bruce and Rubin, 1993; Riel and Levin, 1990; Riel and Harasim, 1994; DiMauro & Gal, 1994). Often the emphasis of the research is on the ways in which groups adapt technologies to their own local setting and context. These studies have made a distinctive impact establishing technology integration as a set of social practices (DeSanctis, .& Gallupe, 1989; Finholt, Sproull, 1990; McGrath, & Hollingshed, 1994). At present, there is limited research on the impact that cooperative telecommunications network design has on the educational experiences of teachers involved in the process of designing the telecommunications technology that they use.

What does it means to collaboratively "build" an on-line community for an educational purpose? We believe that in order to design a network that will be meaningful and purposeful, the community for whom it is designed needs to be explicitly involved in the process in specific ways. The LabNet project began enacting these beliefs by creating a telecommunications network for teachers. After using the Delphi network for three years the LabNet project switched to the *America On-line*™ (AOL) network in February of 1992. Since switching to AOL, the LabNet team has been engaged in the process of redesigning the LabNetwork. It has undergone three major redesigns and numerous smaller changes. The LabNet project was committed to designing, *with* the users, a network space that reflected a i educational purpose: To promote project-based science learning and reflective practice about teaching as one important component of professional development. By creating a telecommunications network dedicated to teacher professional development we hoped to *entool*[1] teachers with the mechanisms for defining and "growing" their own professional development.

This paper examines the process of community-building by cooperatively designing a telecommunications network with users. TERC's NSF funded LabNet telecommunications network serves as the case study for exploring modes of fostering user participation to encourage community-building. A series of research questions emerges that are related to collaboration as a mechanism for successful teacher professional development.

Research Methods and Design

In this paper we trace the ways in which teachers were engaged in the process of shaping both the content and the structure of the LabNetwork. We look at how teachers use the network both to create collaborative relationships and to involve themselves in the design of their network. We focus upon the design changes made to the network as a result of our joint learning process. The data collection methods used include the following: transcribed audio tapes and notes from staff meetings, extended staff-sponsored teacher workshops, both formal and informal user feedback (electronic mail, phone conversation notes and meeting notes), and a user survey.

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1 . R. Ruopp Frontiers of Technology Supported Education: Three Examples in Support of Science Learning, Keynote presentation to SIG/EST, *American Educational Research Association*, San Francisco, CA, April 1992.The term "entooling" was first introduced by Ruopp to consider the use of tools to support student learning. We think it is relevant for teacher development as well.

The Challenge of Collaboration

The challenge of the LabNetwork design is to create and support a nationwide community of practice using a telecommunications network. The community's focus is to promote and incorporate teachers' use and development of science projects to enhance students' science learning. In order to promote project-based learning, teachers share their thoughts about their work. We believe that in order for teachers to grow in their practice there is a need for critical attention to the details of their classroom work and that the details of practice need to be reflected upon and shared in conversations. We recognize that teachers frequently lack the time and opportunities to reflect upon their work experiences and often, like many other professionals, lack the skills to do so (Argyris, & Schön, 1974; Schön, 1983). By sharing and conversing with other professionals on-line, the community can create room for cooperative learning experiences to occur (Grimmett & Erickson, 1988). Collaborative learning and reflection rarely occur in the practice of teaching. Therefore, it is not surprising that it rarely happens in the telecommunications medium.

Telecommunications could potentially be an effective medium for fostering reflective discourse (Ruopp et al., 1993; Gal, 1991; DiMauro & Gal, 1993; Spitzer et al., 1994). Yet, in order to "grow" these experiences, careful consideration needs to be given to the actual design of the network space. It is from this perspective that the research questions emerge: How can designers of educational telecommunications networks and users cooperatively create an electronic space in a way that would foster learning and professional development? What would such a process look like? What could be the impact of the collaboration upon community-building? And how do both the teachers and the staff designers learn about the applications of the design in ways that can help inform the next phases of the design?

Collaborative Step-wise Community Design

In this section we discuss two roles the teachers played in the community-building process: conceptualizing a community of practice and growing a community of practice.

Conceptualizing a Community: Making Room for All Members

The LabNet project has involved users and project staff over a sustained period of time in the creation of a telecommunications network.

Over the course of two years the LabNet area on AOL has gone through many changes — redefinitions in scope, size, and content. The network's conceptual and pedagogical framework was largely defined in October 1991 at a four-day LabNet-sponsored workshop. At this workshop there were a group of teacher leaders (Teacher Moderators or "TMs") who were selected from an application process and who worked in consultation with staff on all facets of creating and supporting the network. The project staff worked intensively with this group, but other users also participated in design decisions once the network was created. At the workshop we began to address the relationship of the network to the community as a vehicle for teaching conversations. In the (transcript) words of one teacher:

> So what we've been designing is pretty much right now a network that fits ourselves to the best way, putting ourselves in a position that it might be suitable for many others. And it's an excellent starting point 'cause each one of us is somewhat a representative of many others. And yet we are not. So, we will have another test which is another reality test besides the work going through here, to look and see how others respond to it. And we may have to go

through the same process with them. But that's maybe perhaps the way to work is to create those situations which people can think and design with us and learn in the process.

Another teacher who attended the design workshop reflected upon the need to reshape the network as we learn more about the diverse needs of the community:

> I feel like one of the difficulties when you're designing and experimenting and trying to do it collaboratively. You may come to a wonderful consensus where everyone harmoniously says,—oh yes we have now reached T[eacher] M[oderator] nirvana and we believe that we are all there. I can see the potential for some people if they're really thoughtful about it and I hope they are, to realize well, you know, this wasn't exactly what I thought it was going to be and I don't think this is for me. I think that's really important and we need to make that clear in such a way that people won't just try to conform. There may be other ways to work with people.

The TMs wanted to "test" their design plans with the users. They realized that the LabNetwork needed to reflect multiple viewpoints and accommodate different ways of working. In some ways, the TMs viewed themselves as representative of the community. Given the diversity of work practices, the group strove for the commonalities and created a flexible design. After shaping the design, the group named areas on the LabNetwork, planned what content should fill each area, and chose graphics as physical representations of our areas.

Designing Professional Conversations about Teaching Practice

After the network design was implemented, we needed to attend to the content—the conversations—that we and the teachers wanted. One of the most critical components of a teachers, network is a place for professional discourse. During the initial phase of the design process, collaborating teachers helped to conceptualize and design an area for this discourse. They named it the "Science Teachers' Area." It was intended to be the primary place for teaching discussions, reflective practice, and collaboration around project-enhanced science learning (PESL). Since it was the only place on the network for teachers to talk about their practice, the area was intentionally left unstructured. We wanted to allow room for the community to define itself within a less-structured space. Our belief was that if the area for discussion was unstructured, community members would start discussions about their teaching that were of interest to them. It is critical to note that throughout LabNet's history, folders have always been created by members of the community, reflecting their areas of interest. Some folders created within this space were of an interdisciplinary nature, but most were subject-focused. This intention, to create space for discussion, meant that interdisciplinary collaborations could be possible because the network's structural organization was minimal. Teachers of different grade levels and subjects, the group believed, would need to interact in a common space in order to meet each other and form professional collaborations.

The first network design met the needs of the community for about seven months. Then we encountered a conflict with space and design. As the community grew, the discussions around particular teaching disciplines become more frequent and were more diversified. There were many conversations and because of technical constraints the LabNetwork had run out of space for new topics. We needed to redesign the network so that it could accommodate the users' evolving needs.

Growing a Community of Practice–Making Room for Diversity

The second design also occurred in response to the community's growth and shifts towards subject orientation on the network. New topics were being created by teachers around subject areas and members were requesting designated space for discipline-specific discussions such as physics, chemistry, biology. A critical point of collaboration occurred when we formally solicited input through a survey that was mailed to all users. Teachers offered opinions that were quite diverse. One teacher, Greg Lockett from California, responded to the question of where to place the specific subject boards and the issues that affected each choice thus:

> There are pros and cons here. Putting the subject boards on the top level really clutters this screen. However, as Ron and I contemplated a chemistry board at the workshop, it was clear that the number of levels available for organizing material was just not adequate. So, I would probably go with sketch #2. Let me share an aside. In California, we are moving toward integrated science instruction. In essence, there is no separation of subject into the traditional categories that you list. Rather than offering earth, life, and physical science as separate courses, we will offer integrated courses called Science 1, 2, and 3. Courses such as these are natural settings for a project approach. By maintaining the current course structure, we are off the leading edge and missing an opportunity to foster the use of projects.

And Mike MacMahon from Alabama answered this question differently:

> That we have two areas (Community Forum and Teachers Lounge) devoted to dialogue speaks to the issue of what makes LabNet distinctive: We are moving toward a community of practice and we want to have dialogue to describe the events along the way. With such a focus, I think we should post the "teachers Lounge" first and then the "Community Forum" second. That is, have the icons for these areas placed close to each other. Encourage the general messages (or those that should be E-mail, but aren't) to be posted to the teachers lounge areas.

After receiving all of the survey responses, the project staff compiled them into one document. This report was disseminated to both staff and users so that we could begin to make informed decisions based upon user input and suggestions. Although the "feedback" offered many viewpoints, there appeared to be consensus that we should create subject folders within the larger framework.

The team was concerned that subdivisions would fragment the community feeling and inadvertently create isolated sub communities that were defined largely by subject matter. For example, Bob Kopicko, a teacher from Michigan, expressed concern over potentially fragmented content:

> . . .the diversity LabNet has moved toward does make it a lively place. I wonder if the focus has changed somewhat away from PESL into a broader discussion of the teaching condition. Do you think most of the participants become active on LabNet to be a part of the community of science teachers and discuss teaching in general or to initially join to learn more about PESL only to find the broader emphasis more rewarding?

The decision to subdivide the network conversations area was not an easy decision. This proposed structural change, as with the others we considered, potentially yielded both wanted and unwanted outcomes.

There was a sense that the community of practice concept could be lost within the restructured framework of the network. We believed that the network design needed to evolve in order to meet the needs of the users over time. The difficulty was that we needed to strive for a solution that met most teachers' needs while also meeting the specific needs of the PESL membership. Our intention was to foster both diversity and community simultaneously. Suggestions were made by teachers and staff to marry these components through structural changes in the design. To that end we created one area solely for interdisciplinary discussions. To diffuse the structure of the subject subdivisions we also made smaller changes within the structure to act as bridges between the divisions. For example, we created another area on the network for all members to share information about grants, professional opportunities, and general information. We anticipated that these changes would support the growing community of practice.

During this redesign, when the focus was being reevaluated, the level of user involvement took a critical turn. Until this point, the users offered input and suggestions only when prompted by staff. From the time of the second design on, the users frequently offered unsolicited suggestions and ideas via electronic mail, folder discussions, and phone conversations. For example, Donna Holmes from Colorado, suggested:

> As the LabNet community grows, we see the need to take steps to manage the community in order to maintain the personal touch. To that regard, we have the following suggestions:
>
> 1. Break the community into "neighborhoods" by subject, grade, location, and/or interest.
>
> 2. Recruit more TM's to fill in vacancies in particular areas, i.e. geographical area, subject areas, etc.
>
> 3. Emphasize recruitment of new members on a local level as well as nationally.

The shift in dynamics in the level and types of community engagement is an important indicator in the process of *entooling* teachers to shape their own learning. In many ways, the teachers have formed their community of practice to resemble, ideologically and structurally, the types of professional development experiences they were seeking. By building a community they have created for themselves new and innovative avenues for professional learning. The collaborative efforts described in this case have continued. The LabNetwork is presently in the process of another redesign and the teachers are taking the most active role in redesign yet.

Discussion

We have learned from this process of "making" a community that design is a human effort and that the factors that contribute to its making are determined largely by human variables. Design is shaped largely by human invention and interaction. Designers need to engage their users in the building process if the intention of the network is to foster collaboration. This process has been a complex venture that has attempted to incorporate many social factors within design efforts. Continued research on the educational outcomes of network design should take into account the variations on the purpose as interpreted by the community.

Through the collaborative design process the LabNet project has enacted modes of *user-designer participation* based on the concept that a purposeful network is driven by content that is meaningful to the users.[2] In this model, the content and discussions about teaching issues were the force that drove the network design changes. In essence, the community discussions, manifested in network messages, were the catalyst for structural changes on the network. Once structural changes were decided upon by the group and implemented, the shape of the network was altered. This alteration affected the ways in which the community used the network and worked to diversify the content. Users reacted to the "openness" of the network structure that they had collaboratively created in two ways: They used the network to discuss teaching practice, and they recruited other members in order to shape a community of teachers. Subsequently, the message content and foci grew. As a result of this growth, the network structure no longer was appropriate; discussions were difficult to return to and different conversations of similar topics were scattered throughout. Before each structural change, the users engaged in extensive discussions with project staff in order for the group (users and staff) to learn about the needs of the community in ways that would help inform the next design.

Social Factors That Foster Effective Collaborative Design

Through the process of cooperatively designing an educational network space, we have identified some socially constructed situations to help inform other on-line communities that are seeking to promote professional dialogue. These factors, we believe, play a critical role in cooperative community-building and can work to close the gap between intentions and outcomes. Social factors that foster effective collaborate design include the following:

Create a Purposeful design

A compelling educational design needs to be motivated by a clear pedagogical perspective. This perspective must reflect users' needs and interests. For example, the LabNet project was created in order to foster teachers' use of project-enhanced science learning through reflective practice.

Design from a pedagogical perspective

The pedagogical perspective must be clearly articulated to the members of the community and represented on the network. LabNet's philosophy promotes dialogue and professional collaboration. Therefore we carried this philosophy into the network design–leaving areas largely unstructured so that teacher dialogue could occur.

Involve a leadership group

It is essential that network designers engage their users in the design process. Sustained user involvement helps ensure that the designers serve the needs of the community. LabNet involved teachers in the network design in two ways. We involved a small group of teacher leaders to work intensively with us over a sustained period of time, as described in the case study. In addition, we also made frequent contact with most or all of the users via user surveys and e-mail, soliciting their input at critical junctures in the process.

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2 . In work-based settings, the study of Human Computer Interaction (HCI) has focused on the process of cooperative design. In particular, the interplay between developers and user participation has been suggested as an effective method for design. See, for example, J.D. Gould and C. Lewis, Designing for usability: Key principles and what designers think, *Communications of the ACM 28*, 3 (1985), 300-311. See also J. Grudin, Interactive systems: Bridging the gaps between developers and users, *IEEE Computer* (April 1991), 59-69.

Test design theories
To facilitate a common understanding between users and designers, suggestions for design changes need to be informally and formally tested. For example, before implementation, we provided either screen mock-ups or identified illustrative areas on AOL.

Negotiate a common understanding
Users and designers often have different levels and types of experience. Therefore technical terms and protocols need to be negotiated before and during the process to establish common starting points. This will allow the design team to better explore and explain their intentions as translated into the design. For example, during teacher leader workshops, time is devoted to technical discussions.

Acknowledgments
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Demonstration
Integrating the Internet and Multimedia

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Abstract

The use of Internet and other commercial on-line sources is growing at an explosive rate. Never before in the history of humanity has an individual had so much information available. It is possible to access most of the great universities in the world from the comfort of one's home. The whole world is a library and individuals with on-line research skills are light-years ahead of those who are still poking along in a conventional manner. Individuals using e-mail and on-line conferencing are solving problems while other decision makers are still attempting to set meeting dates to discuss the problems. Subordinates with on-line research skills are better informed than many of their bosses. Teachers with on-line research skills know more about educational problems and where to find the solutions than do school boards, superintendents, and school administrators. Teachers are talking directly on-line to the United States Department of Education while administrators are calling their "network buddies" attempting to find out how to get the mailing address. The information superhighway is changing the way that American firms and education are doing business.

In the field of multimedia, medical schools, law schools, research facilities, and an array of other professionals are converting valuable knowledge into multimedia presentations. Universities and businesses all over the world are using multimedia to better educate their employees and students.

This sixty-minute demonstration will touch on the power of integrating these two powerful tools we have available today. It can be used by educators, researchers, businesspersons, and—last but not least—students.

Project
Telemation Training and Development: Developing Inservice for Curriculum Integration

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Key words: integrating telecommunications, curriculum integration, teacher telecommunications inservice

Abstract

The California Telemation Project has recently completed eighteen training institutes, focusing on strategies for incorporating telecommunications into effective learning designs. Teachers and their administrators attended training in basic telecommunications skills plus facilitation in the development of student-centered curricular projects. Presenters in this session represent several different aspects of this project, a collaborative effort to bring curricular reform and technology infusion into the K-12 learning environment.

The California Telemation Project is a collaborative program to provide educators with professional development in the use of telecommunications to enhance teaching and learning. The primary emphasis is on integrating telecommunications-based resources into site-level planning, curriculum, learning strategies, and student-centered activities to benefit both teachers and students. Eighteen partners, administrators from a variety of educational agencies throughout California, have worked throughout the past year in developing the program and follow-up support activities that will facilitate the 24 local telementors from their region.

Twenty state telementors have been selected to develop curriculum using on-line information as learning resources. The telementors were trained in curriculum development, group facilitation skills, and telecommunications usage during 1993-94. In conjunction with this training, each developed a plan integrating telecommunications-based resources with California framework-based curricular content, which served as models for institute training. In addition, each telementor offered a five-day telemation institute for 24 local telementors from their region.

Local telementors, the institute participants, were selected early in 1994. Currently, the 450 local telementors are developing their own telecommunications classroom projects, using the telementors' plans as models. Principals of the local telementors were encouraged to attend six hours of training presentea by the Association of California School Administrators and coordinated through the Telemation Project.

Benefits to teachers are communication with other educators through CORE/CSUNet and other electronic networks, competency in information literacy—the ability to access, evaluate, and use information from a variety of sources, and support from telementors with initial telelearning activities. Benefits to students are expanded global awareness, development of skills in information literacy, increased critical thinking skills, and access to up-to-date information.

Telecommunications Research and Evaluation Project. Far West Laboratory (FWL) is evaluating several aspects of this project: the Telementors' training, their institutes, and the classroom use of telecommunications by all participants. Results of this evaluation will inform future phases of telemation.

TeleLearning Mobile Unit (TMU). A TeleLearning Mobile Unit (TMU) has been designed as an applied classroom learning center. In each training session participants have simultaneous on-line satellite-relayed access to telecommunications as well as other new technologies. Twenty-four workstations, offering choices of either Windows or Macintosh computers, are networked. Each workstation has an independent telephone connection by way of satellite, so each participant can select and access on-line resources.

Access to other technologies, including laser disk players, CD-ROM drives, a satellite down link and a library of print and non print resources, is also available in the TMU.

The Telemation Project is made possible by a grant from the California Department of Education under the provisions of the California Master Plan for Educational Technology and SB 1510.

Social Studies

You're Invited to a Tu B'Shvat (Arbor Day) "Telecommunity" Celebration! Hosted by: GesherNet

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Key words: telecommunications, curriculum projects, Israel, K-12, interdisciplinary, Internet

Abstract

Holidays provide a focus for learning, sharing, and building a sense of community across disciplines and across the world. Experience a "telecommunity" holiday event—from its organization through the celebration!

This project took place in January 1994 as part of the GesherNet international Jewish day school networking project. All communication was via the GesherNet list hosted by the Israel project on Nysernet (Geshernet@Israel.Nysernet.org). Students in grades five through seven in four states and Israel took part in this celebration of the birthday of the trees. It serves as a model for structuring successful educational telecommunications projects across all curriculum areas and grade levels.

The presentation includes the planning process, project activities, interdisciplinary approach, functions of telecommunications, samples of communication, and a project evaluation. Highlighted are the off-line organizational and classroom management considerations that contribute to the successful integration of a telecommunications learning event into the curriculum.

Preparing for any celebration (Thanksgiving feasts, carnivals, the birthday of the trees), whether in the traditional manner or in a telecommunications environment requires a tremendous amount of thought, organization, and work. If you've attended to details beforehand and maintain the flexibility "to seize the moments" which present themselves during the event, your celebration is bound for success and your guests (participants) for an engaging, outstanding time.

A Tu B'Shvat "Telecommunity" Celebration was selected because holidays offer a motivating context for learning, and the customs and themes of Tu B'Shvat lend themselves to an interdisciplinary approach to the holiday. By design, the project required little knowledge of computers by teachers. Emphasis in this pilot project was on encouraging classroom participation and extending the concept of community, without technology posing a barrier.

Project Goals

- Demonstrating how telecommunications can enhance learning within the Jewish school setting
- Collaborating across disciplines and school sites in celebrating a holiday
- Observing the holiday of Tu B'Shvat in ways meaningful to students
- Enabling students to build new working relationships and friendships
- Building a concept of community that embraces distant schools as well as the natural environment
- Strengthening students' appreciation for and connection with nature

Activities
Teachers were offered activities to join with their students and could also incorporate any relevant activity that was part of their existing curriculum. Activities covering the subject areas of science, social studies, English, and Judaic studies engaged students in poetry reading and writing, research, values clarification, literature discussions, observation, data collection, drawing analogies, journal writing, and artistic expression.

Planning for the Tu B'Shvat Celebration
Meetings were held with a core group of educators and administrators from each of the Los Angeles area schools. Phone conversations, e-mail correspondence, and conventional mail were used to communicate with technology teachers at each of the schools in New York, Philadelphia, Cleveland, and Israel. They then introduced the project to their administrators and staffs. The final lesson plan was transmitted electronically. Beyond the usual components of project description, objectives, timeline, and activities, participants were given support and suggestions for conducting the telecommunications project, examples of which follow.

Grouping for activities
When selecting activities take an interdisciplinary approach. Students will feel a continuity from one curriculum area to another and teachers can work in a "team" spirit. An entire class may work on one activity, or groups of students may select different activities. Groups can rotate to different activity centers.

The "nature" and "typing" of messages!
Keep messages about 1/4 page in length. Students may prepare individual or group messages. A spell checker helps eliminate spelling and keyboarding errors.

Typing suggestions: Students compose at the computer during scheduled computer time; assign students to be typists and issue passes to the computer lab; students with computers at home help with typing; parent volunteers assist with typing.

Staying informed
Place all communication in a loose-leaf notebook divided into sections by activity as designated on the message subject line. Assign students to update and share this notebook. It will be a key resource for planning the culminating shared community holiday event at your school, and it will become a source of materials for future years.

Additional notes were sent to the technology teacher offering tips for uploading and downloading messages. They included formatting requirements and suggestions for naming files and designating subject lines which would facilitate keeping order and organization while working in a listserve setting.

Evaluation: What We Have Learned (or confirmed)

- Building a successful educational project requires a tremendous amount of planning time and continuing guidance (moderation) throughout its execution. (Successfully designed projects will even withstand blizzards on the East Coast and the Northridge Earthquake on the West Coast!)

- The project served as a positive catalyst in bringing teachers of different disciplines at different schools together and in enhancing the sense of community.

- Teacher commitment and administrative support are keys to establishing meaningful and effective uses of telecommunications.

- Technology awareness and training facilitate engaging teachers other than the technology teacher.

- Telecommunications-based projects *do* produce valuable resources.

- Unplanned circumstances highlight the empowering, community-building aspects of working in a telecommunications environment and the importance of bringing relevancy to learning experiences.

Summary

The seriousness of purpose that went into the design of this holiday project was reflected in the sense of commitment with which teachers participated. In the Bank Street College Center for Technology in Education 1993 survey, *Telecommunications and K-12 Educators: Findings from a National Survey*, survey participants cited the following factors as being most influential to the success of student-based telecommunications activities: advanced planning, full cooperation of teachers, well-defined scope and content of activities, relevancy of the activity to the teacher's ongoing curriculum, a timeline for exchanges, and technical support.

The Tu B'Shvat project addressed each of the above considerations. The interdisciplinary nature of the activities cemented teachers' commitment to the project. Students' motivation was boosted by the fact that their contributions to the celebration would be shared with students near and far, this year and in future years. Although the untimeliness of natural disasters interrupted the timeline for bringing the intended closure to the project, the positive educational outcomes prevailed. Insights gained from Tu B'Shvat '94 will be taken into account in modifying the project and developing other educational projects for the 1994-95 school year.

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Remote/Distance Education

Distance Learning: Possibles, Potentials, and Problems

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Abstract

The Center for Excellence is located on the Bloomington Campus of Indiana University. Its mission is to explore appropriate applications of technology to teaching and learning in diverse settings. As distance learning technologies improve in quality and become less expensive and more accessible, schools are beginning to take advantage of them.

CEE is playing an important role in helping educators understand the new technologies, developing criteria for selecting and implementing distance learning technologies and programs, and shedding light on the myriad issues that schools face as they design learning environments that include distance learning.

When we analyze the strengths, weaknesses, and developmental trends of new resources to use in the classroom and to serve as sources for inventing new educational projects, we can include distance education technologies, such as:

- *telephones —telephones in classrooms, speaker phones, video phones*
- *computers — BBS's, Internet, commercial conferences systems.*
- *audio graphics — interactive audio and graphic communication*
- *Video teleconferencing — TV, satellite, dial-up*

When used appropriately these technologies can bring powerful new learning experiences into our classrooms.

It is easy to be enthusiastic and innovative with these technologies. However, it is equally important to be informed and realistic about their current limitations. We will design truly effective distance learning programs only when we consider issues such as training, support, classroom administration, program administration, curriculum development, and evaluation.

The Center for Excellence in Education makes presentations, produces materials, develops workshops, and delivers training to help meet the needs of teachers and administrators as they investigate new technologies and how best to use them.

Remote/Distance Education
World Wide Telecommunications, K-12: I*EARN Curriculum Projects

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Abstract

*Collaborative curriculum is the name and telecommunications on I*EARN (International Education and Resource Network) is the game. Contact any of these four Albuquerque Public School teachers for more specific information:*

> ***Marie Levy Ryan** <levyryan@apsicc.aps.edu>—French Environmental project. Marie is interested in working with French-speaking students.*

> ***Mike Loughrey** <loughrey@apsicc.aps.edu>—First People's Conference. Mike enjoys working with Native American curriculum.*

Gayle Anderson <*anderson_g@apsicc.aps.edu*>—*Heroes project and publication. Gayle is involved with authentic assessment and social studies projects.*

Tom Healy <*healy@apsicc.aps.edu*>—*Bilingual Spanish curriculum. Tom is immersed in emergent literacy and multimedia technology programs.*

*I*EARN is about "youth using telecommunications to make a difference in the world." Participants come from 23 countries: Argentina, Australia, Belgium, Brazil, Canada, China, Russia, Costa Rica, England, Finland, Hungary, Israel, Jordan, Japan, Kenya, Korea, Mexico, Netherlands, New Zealand, South Africa, Spain, United States, and the West Bank.*

*Mike Sullivan (msulliva@tenet.edu), SEDL (Southwest Educational Development Lab), has an excellent video on two New Mexican I*EARN projects. Elementary students in Carolyn Meehan's (meehan@apsicc.aps.edu) fourth grade worked to send orphaned children in Bosnia positive thoughts. Charly Bullock's (schlashiwi@technet.nm.org) Native American Chapter One Literacy students communicated with students in Argentina, sharing thoughts about community fire fighting and its dangers and glories.*
*The process of connecting with people across the globe on collaborative curriculum is an integral part of I*EARN. Another integral portion, an end product of the process, is student publications on the holocaust and the environment, and two literary magazines. To obtain current copies or receive more information about I*EARN, please contact iearn@igc.apc.org.*

Community
Merging the Local/Global Electronic Community

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Key words: BBS, Internet, networking, telecommunications

Abstract

Following three years of implementation, Hong Kong International School has expanded the Dragon BBS and integrated full Internet capabilities. This has been an important yet difficult expansion. The building-wide network allows Internet access from any room and has been enthusiastically received by teachers reaching out for global contacts. This presentation will highlight the development of this student-managed community communications resource and discuss practical experiences with creating an accessible infrastructure, targeting appropriate information resources, and using telecommunications to build a caring human community.

HKIS Dragon BBS—Accessible Communications Infrastructure
Last year at Tel•Ed '93, the HKIS Dragon BBS was introduced as a possibility for developing a student-managed community communications system. The BBS continues to grow in importance for students and teachers at HKIS. Almost fifty class conferences in diverse subjects such as English, Social Studies, Health, Technology, and Modern Languages have become productive educational tools. Remote access to the CD-ROM tower and the BBS through ten dial-in lines has been well received by parents and students. The CLASSLink Echomail system continues to link fourteen schools across Hong Kong in areas of common interest such as Model UN, the environment and technical subjects.

Last fall HKIS decided to link the four campus buildings together, using 64K dedicated lines; at the same time HKIS became a full Internet node. Our international gateway is provided by the Hong Kong University of Science and Technology. Access to both the BBS and the Internet was enhanced by wiring the high school building. Direct connections to the BBS and the Internet without the need of modems are now available from all offices, computer labs, and classrooms.

The greatest challenge was linking the BBS and Novell networks to the micro-VAX communication servers, building bridges across the networks and making this whole structure transparent to the users. These issues will be discussed as part of the presentation. Transparent access to the system is directly related to its use and educational significance.

Targeting Appropriate Resources
A BBS is totally flexible in design, and the Internet is absolutely overwhelming in terms of resources available. A major part of designing a communications system is providing appropriate resources and conferences for a school environment. The conference structure of the Dragon BBS was built by educators over the last years and represents an attempt at such an organization. In February 1994 we began to develop the main menu of the HKIS Internet access, making use of selected Gophers, World Wide Web and Hytelnet. The Usenet forums are too massive for our computers, so we access to the university services directly. We must find other ways to focus on forums that are most appropriate for school use.

Our professional librarians have been the most help in locating the best resources and developing simple instruction guides for using the Internet. This is an exciting step in the continuing redefinition of the role of media specialist/librarian in schools. The presentation will describe steps along the way and decisions that have been made in the continuing process of building information tools for education.

Building a Caring Community
In all the excitement of building communications systems and linking to the world, we continue to spend large amounts of time on the human issues of this new type of community. Electronic communities should include everyone. Educating all users in the proper use of telecommunications increases in importance with global links now possible. Inappropriate use of FTP could not only disable our school links but could affect the Internet links of the university as well. A few students still seem to think that "hacking" into the BBS and the Internet is an important way to express their selfhood. Student-managed systems may be the best way to develop leadership skills in a large number of people and at the same time most effectively deal with the problems that arise.

Community issues are also important as we are charging people for Internet accounts to pay for the dedicated lines. People expect more reliability and service from a system that they pay for. Currently we are able to offer full Internet access for US $125 per year. This includes unlimited time with no other charges.

Finally, the global Internet and the local BBS have forced the issue of comprehensive participation. Top administrators, every teacher, and families in our community need to participate to make the system a comprehensive service. Community awareness and training sessions are part of the structural foundations of this communication and information infrastructure.

The presentation is intended to foster discussion on the importance of human issues in telecommunications.

Teacher Training

Goin' Gopherin' in Teacher Ed

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Key words: tel ..mmunications, gopher, teacher education, educational resources

Abstract

The Internet opens up a world of information to students and educators alike. Telecommunicators may discover new ideas, discuss timely issues, and exchange limitless information for administrative and instructional purposes. As computers, modems, and other methods of connecting to the Internet become more and more available, teachers must learn to use these effectively as support for a wide variety of professional activities. However, one barrier (once basic access issues are solved) often involves sifting through and finding specific information on the information superhighway. Gopher provides an easy-to-use, efficient method of minimizing this problem.

The presenters, both currently teaching in colleges of education (at East Texas State University and at West Texas A&M University) have required both undergraduate and graduate students to utilize Internet connections as integral components of their teacher education courses. Exploration of Gopher sites provides the students with access to resources throughout the world for themselves, their K-12 students, and their colleagues.

Preservice teachers access lesson plans (as examples of what is being used in classrooms), as well as discussions of educational issues, and these are integrated into their university classroom activities. As they find and use some of the numerous research facilities available through the Gopher menus, they discover material that can be used in ALL of their classes—not just in teacher education. In their assigned schools, during student teaching, they look for (and expect to find) the modem that will allow them to use Gopher "on the job." As they use their Gophering skills, they become "teachers," exposing the school faculty to the ease of use of the Gopher menu system and the treasures to be found therein.. Use of Gopher and other Internet activities during this undergraduate experience encourages these teachers of tomorrow to be worldwide information and idea seekers who will encourage their students (through modeling) to do the same.

Graduate students in educational computing courses (most of whom are K-12 teachers and/or administrators) explore Gopher resources that apply to their individual teaching assignments and other professional responsibilities. In addition to using research databases, retrieving lesson plans, and exploring and cataloging resources that apply to specific disciplines, each student prepares lesson plans utilizing Gopher resources. Educational administrators also design in-service (faculty development) activities that will help them introduce their faculties to the treasures to be found through Gopher.

Students are encouraged to use e-mail to communicate their findings (from Gopher and other Internet resources) and questions to fellow students (and their instructor) while they are taking classes and to continue this after the class has ended. This facilitates a university/K-12 partnership, providing on ɔing support as a follow-up to the university educational computing classes.

This presentation will describe the use of Gopher in both undergraduate and graduate college of education classes, as well as in some public school classrooms (by the graduate students). Specific examples of activities will be presented, and a list of Gopher sites, as well as suggested activities at each site, will be available.

Curriculum

Establishing Listservs for Curriculum and Research Enhancement

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Key words: telecommunications, listservs, higher education, teacher education, curriculum enhancement

Abstract

Listservs and other forms of computer-mediated communication allow educators to enter into subject-or discipline-specific communication with an international array of colleagues who would not be readily accessible through traditional means. Both educators and researchers have been able to use listservs as a forum to share information, research methodology and findings, rare sources and documents, and advice. Listservs allow contact with experts in the field, some of which would previously have been unthinkable or difficult at best.

Owning and moderating a list has hitherto been an area relegated to computer telecommunications experts. Typically, competence as a list moderator is gained by trial and error, and practical experience or pragmatic caveats are rarely communicated beyond a personal level. A general overview of the functions, responsibilities, and mechanics of list moderation and ownership (from a personal standpoint) has not previously been widely available. Documents detailing the technical aspects of list establishment, maintenance, and use are available on-line and can appear quite intimidating to most computer users. The presenters have discovered that knowing the right person to go to and the questions to ask is essential. Participants in this session will have the opportunity to hear about, ask questions about, and discuss the listserv experience with two educators who have established lists that are used in support of specific academic endeavors. Emphasis is on the administration and use of the list, rather than on the technical aspects.

Each of the presenters is currently operating an education-oriented listserv. One, a faculty member, is the owner of ETECESP, an unmoderated list for current and former students in her graduate educational computing classes, as well as anyone else who wishes to join. The list is used for dissemination and discussion of information about educational computing issues, with an emphasis on K-12 and teacher education. Graduate students gain on-line experience as they post to the list, and non students have the opportunity to participate in these class endeavors. As students gain experience posting and responding on ETECESP, they "branch out" into other Internet activities.

The second list operator is a principal and doctoral student who has established a moderated list (HMEDRSCH) to fill a specific research need for growing numbers of people. Home Education Research is a moderated discussion list for scholars, researchers, and others professionally interested in the area of home education. The list is limited to individuals who are involved in, or have conducted, scholarly research in the area of home education and continue to have an active interest, or for those that have a professional or ministerial interest in serving the home education community.

This session will present the basics of initiating a listserv, explanations of general listserv header configurations, and explanations of general listserv commands for list owners. The time and responsibility commitments a list owner and moderator have to both the list subscribers and the host computer system will be discussed. Handouts covering a variety of list owner and

moderator areas, including explanations of general listserv commands and an outline of considerations necessary during the conceptualization and initiation of a list, will be available.

This presentation is designed to help people realize that— when there is a need to communicate— setting up a listserv is a viable option.

Project
Internet in the Home: Kids as Teachers

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Key words: Internet, student-driven, home, activity, telecommunications, parent

Abstract

As more home computers include modems, telecommunications is becoming a ever-popular tool for making the home-school connection and supporting home learning activities. This session will include an array of Internet activities designed for a home learning environment and suggestions from a current student about how kids can successfully teach the rest of the family how to explore the world of telecommunications.

Teachers and students all over the world have created unique projects and activities which incorporate the tools of global communication into a traditional learning environment. In fact, Judi Harris from the University of Texas at Austin has been collecting these projects for several years. In the May 1993 column of **The Computing Teacher,** *Judi described 15 different activity types.*

By asking the question "What is the nature of the interaction?" Harris's list has been condensed into eight skeleton telecommunications activity structures from which interesting, rich, and fun on-line projects can be built.

These categories of on-line educational activities include:

- *international exchanges*
- *communication with experts*

1: 5

* *social action*
* *information gathering*
* *special events*
* *information exchanges*
* *experiments and surveys*
* *simulations*

Sample activities will be presented for each category selected from more than thirty presented in a soon-to-be released book authored by Deneen Frazier.

This session will also include a current elementary teacher, who demonstrates how successful classroom activities can be adapted for the home environment.

A discussion of the parent's and student's role with telecommunications in the home will include the insights and perspectives of a young adult and a parent. Out of this discussion a list of tips and barriers will be developed.

International Project
International Curriculum Connections

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Abstract

*I*EARN (International Education and Resource Network) classroom projects connect schools around the globe. This session will explore some of the work that students in Puerto Madryn and Zapala (Argentina), Barcelona (Spain), Zuni Pueblo (New Mexico, USA), and Albuquerque (NM, USA) are doing together. Telecommunications and video telephone projects will be described.*

Participants include:

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Society Session
SIG/Tel 1994 On-line Activity Plan Contest Winners

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Abstract

The Activity Plan Contest is conducted on-line. Announcements are posted after the first of the year. Entries are submitted by late March and winners are announced in April. Winners are introduced and receive their prizes at NECC in June. Poster presentations are made at the Tel Ed Conference. Winning SIG/Tel Activity Plans are published in the SIG/Tel T.I.E. (Technology in Education) Journal. The journal is published four times a year, and each issue contains several of the plans.

Winners

"Bear"ing in Mind Our Shared Values in a Global Village
Marilyn Wall, John Wayland Elementary School, Bridgewater, VA
mriel@attmail.com

Telexchange Mascots
Mrs. Sara Fischer, Winfield Township Public School, Winfield, NJ
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A Virtual Tour of the River Thames
Patricia Ann Weeg, Delmar Elementary School, Salisbury, MD
Michael Burleigh, United Kingdom
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Network Collaboration: Senior Citizens and Elementary Students
Clare Blaha Devine, North Dover Elementary School, Toms River, NJ
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The "Problems" Project
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Penny Bond, Travis Junior High, Conroe, TX
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Thinkingland—A Collaborative Journal -Writing Environment
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France at Your Fingertips
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Blame It on the Air
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Blooming Biomes
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Reach Out! Extend a Global Handshake
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Honorable Mention

Weather or Not
Mrs. Donna Dowd, Ridgewood I.S. 93, Ridgewood, NY
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Wired to the World
Susan Hess, Juan Morel Campos Intermediate School 71K, Brooklyn, NY
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Jobs 2000
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Shelter Together under the Sun
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A Student's Guide to Managing Money: A Collaborative Research/Writing Project
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Use of a BBS Conference and E-Mail to Facilitate Mastery Learning
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Community

The Internet and the Parent Community: A Case Study

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Key words: Internet, parents, families, k-12, community

Abstract

The purpose of this study was to investigate the effect that direct and unrestricted Internet access had on the parent community. As part of an ongoing study involving the Internet and K-12, Florida Institute of Technology's Academic and Research Computing Services department delivered free Internet access to the homes of 15 families within the local community. Access was provided via high-speed modems using Point-to-Point (PTP) links. All parents within the study group had their own computers and modems; we provided them with the required software and technical support. Families selected also had children who attended one of two area high schools that have Internet access. The study explored the barriers these parents encountered in using the Internet, how and when they elected to use it, factors that influenced their continued use of the Internet, and the types of changes that occurred within the home environment as a result of Internet use. Early findings suggest: extensive training in how to use Internet utilities is required; home-parent Internet access conflicts with other family activities including, children's sports, church activities, and personal employment requirements; and the greatest barriers to home-parent Internet use are time, the degree to which the home computer is used for local activities (e.g., word processing, spreadsheets, etc.), and the availability of a free telephone line.

Paper
The Internet and High School Teachers: A Case Study

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Key words: technology, Internet, K-12, networks

Abstract

The purpose of this study was to investigate the effects of direct and unrestricted access to the Internet on a group of high school teachers. Based on the naturalistic inquiry paradigm, this study explored the barriers these teachers encountered when using the Internet, how and when they elected to use the Internet, the factors that influenced their continued use of the Internet, and the transitions they experienced from using the Internet. Data collection was based on Patton's three approaches to interviewing; data analysis was based in part on Miles and Huberman's model of data reduction and display and on Spradley's task of domain analysis. Interviews were conducted by a four-member research team. Findings suggest: teachers require ongoing Internet training, technical support, home Internet access, and time in which to learn and incorporate the Internet into their classes; Internet use can increase teachers' self-esteem and improve their attitudes toward computers and education; and use of the Internet by teachers encourages them to restructure their classes and schedules to accommodate Internet resources within their classrooms.

Introduction

Today, an increasing number of K-12 schools are establishing connections to the Internet. As more schools acquire Internet access, it becomes essential that we evaluate the impact of such a connection on the educational program, including its impact on teachers. If K-12 teachers are to be successful in incorporating the current Internet and impending national network (whatever it might be called) into their classrooms, then teachers, administrators, and educators who influence teacher training and reform activities need to have a firm grasp of the ramifications of "being connected to the Internet." At the very minimum, teachers need to learn and understand how an Internet connection can become a part of their classrooms; they will need support in identifying and locating sources of information that contain resources of interest to them and are relevant to their academic disciplines; and they will need to learn how to acquire this information and incorporate it into their teaching. Influential educators and teachers therefore must know the answers to such questions as, What factors contribute to teachers' use or lack of use of their school's Internet connection? What support services are needed to help teachers use the Internet to pursue their educational or professional goals? What compelling pedagogical reasons are there for using the Internet? What role or behavioral changes do teachers experience when trying to incorporate networking activities into their classes? What motivates teachers to continue using their Internet connection? What is a typical teacher's usage profile? In what way does an Internet connection affect teachers' views on education? and What special problems or barriers do teachers encounter by virtue of having an Internet connection? This study attempted to answer these questions by examining and describing the personal and educational interactions of a group of high school teachers who had direct and unrestricted access to the Internet from their classroom desktop computers.

Method

In order to address the questions above, it was necessary to evaluate individual teachers' interactions with the Internet over time. We operated under the premise that ". . .understanding emerges most meaningfully from an inductive analysis of open-ended, detailed, descriptive, and quotational data gathered through direct contact with. . .participants" (Patton, 1990, 119). Consequently, qualitative methods were used to acquire the information being sought; the perspective used was naturalistic inquiry (Lincoln & Guba, 1985).

Setting

The setting for this study was a grades 9-12 high school located in an urban East Central Florida city. The high school consisted of several buildings, including an administration building, library, general classroom buildings, gymnasium, cafeteria, and vocational education building. The selection of this particular high school was opportunistic. Within the past year the school had undergone a multi-million-dollar renovation that included the installation of a local data communications infrastructure. This infrastructure used fiber-optic cable to interconnect the school's buildings and unshielded twisted pair wire to provide data connectivity to the classrooms. Classrooms, offices, and labs had data face plates mounted on walls near teachers', administrators', and staff members' desks, and all school personnel were assigned Apple Macintosh computers and SilentWriter printers. With Ethernet technology, these computers were connected to the data jacks in the rooms, thereby forming a local area computer network. Two weeks before the investigation, a high-speed (56,000 bits per second), dedicated network connection was installed between the high school and the local university. Internet-related software, including MacTCP, NCSA Telnet, Fetch, Eudora, TurboGopher, HyTelnet, NewsWatcher (later replaced by Nuntius), and Finger was loaded onto the participants' machines. (Mosaic was not available at the time of this study.) The high-speed data circuit provided Internet connectivity, and the applications provided the necessary tools to access Internet resources.

Sampling and Subjects

Fifteen teachers (eight women) volunteered to participate in the study. Of these fifteen, seven (three women) were ultimately selected as subjects. The selection of the seven participants was based primarily on the data collected from the set of preliminary forms that were distributed to the fifteen teachers composing the initial group and input from one of the vice principals, who was asked to identify those teachers who he perceived would be information-rich sources and typical of teachers at other schools.

Data Collection Methods

The study data were gathered during the second semester of the 1992-93 academic year (from January 13, 1993, to June 4, 1993). Primary data collection methods included three different interview approaches; secondary methods included personal reports, log books, and messages generated by the participants. All data collection occurred on-site at the high school at times that were convenient to the teacher participants, namely, during planning periods, faculty inservice days, teacher work days, and after school. A research team consisting of the primary author, two of his work colleagues, and a formally trained qualitative researcher with interviewing experience also collected data. All interviews were tape-recorded and the recordings were transcribed for data analysis.

The first type of interview—informal (Patton, 1990)—was held individually in each teacher's classroom with the investigator and participant seated at the teacher's desk in front of the computer. This natural setting was conducive to using the computer as a projective medium—it stimulated the participants to discuss their personal experiences and feelings by recalling certain reactions to specific Internet applications or resources. These interviews also enabled the interviewers to provide the participants with one-on-one assistance in using the Internet. Informal interviews were held at least once a week, two or three weeks a month, throughout the course of the investigation, for a total of 48 interviews. Informal interviews averaged one hour in length.

In addition to the informal interviews, four group meetings were conducted using the general guided interview approach, which "helps make interviewing across a number of different people more systematic and comprehensive by delimiting in advance the issues to be explored" (Patton, 1990, p. 283). A list of relevant topics was derived from participants' responses from the informal and formal interviews. The guide provided a predetermined focus for the interviews and served as a checklist to ensure that all the topics were covered during an interview. Group meetings were held in a large conference room located in the new administration building; no computers were present for these interviews. The meetings averaged one-and-one-half hours in length.

A third interview approach used was the standardized open-ended interview (Patton, 1990). This approach consisted of a set of carefully worded questions written exactly as they were to be asked during the interview. The basic purpose of this approach "is to minimize interviewer effects by asking the same question of each respondent" (Patton, 1990, p. 285). The standardized open-ended interviews were the most structured of the three interview approaches used in the study, and they reduced the need and opportunity for the interviewer to make judgments (e.g., explaining, clarifying, or rephrasing a question), which can lead to interviewer effects. An experienced qualitative researcher was hired to conduct all the standardized open-ended interviews. Four standardized open-ended interviews were administered during the course of this investigation—one every four to six weeks. Respondents were given a copy of the questions during the interviews so they could both hear and read the questions as they were being asked by the interviewer. This procedure facilitated standardization, since all interviewees were able to read and respond to the same questions. Formal interviews were held in the privacy of the principal's conference room and averaged one hour in length.

An exit interview, held on the last day of the study, was conducted as a group meeting. This interview was designed to be reflective in nature so that the respondents could contemplate their experiences of the previous five months. The interview was also designed to establish closure and to thank the teachers for their participation. As was the case with the other interviews, the exit interview was tape-recorded and the recording was transcribed for data analysis. This interview was approximately one-and-one-half hours in length.

Two secondary sources were also used—electronic mail messages and journals/reports. E-mail messages and the team's corresponding replies were saved in a computer file and included in the data analysis; entries from journals/reports were transcribed from handwritten to electronic form and saved in a computer file. These data were also included in the data analysis.

Data Analysis

Data collected from informal interviews and e-mail messages were reviewed by members of the research team. Recurring themes and similar comments made by the participants were highlighted by and shared among members of the research team "to get a handle on what [was] important enough to follow up in detail" (Lincoln & Guba, 1985, p. 235). The information acquired from these two initial data sources led to the construction of more structured data collection instruments—an interview guide for group interviews, and a formal set of questions for the structured open-ended interviews. Responses to questions asked during the informal and group interviews helped us target specific areas to address in the formal interviews. Responses from the formal interviews were used to compare and substantiate participants' comments received from informal methods and to generate conjectures.

Transcripts of all data sources (including responses from the exit interview and comments made in participants' journals/final reports) were distributed to three research team members who independently searched for key patterns or themes (i.e., common occurrences of concepts) from the data. As these concepts emerged, team members assigned "labels" to them (e.g., problems, attitudes, time commitment). The creation and assignment of these labels were discussed collectively by the group and underwent several evolutions until the team agreed on a final list. The method used to determine the patterns and themes was based in part on Spradley's (1979) domain analysis. Four major categories (domains) emerged from the data: problems, usage, influences, and transitions. These domains were further partitioned into two levels of subcategories that Spradley calls "cover terms" and "included terms." Several cover and included terms were identified and are discussed below. Electronic versions of all transcripts were also entered into the computer program, The Ethnograph (Seidel, 1988), with key passages "marked" electronically. The Ethnograph provided us with an efficient method for reviewing and comparing patterns and themes among the more than 3,000 pages of transcripts that were produced.

Findings and Interpretations

Four primary domains emerged from this investigation:

1. problems teachers encountered when using their Internet connections
2. situations in which teachers used the Internet
3. factors that influenced teachers' continued pursuit of using the Internet
4. changes teachers perceived in themselves as a result of using the Internet.

Domain of Problems

Three cover terms and five included terms emerged in the domain of problems:

a. Problems of comprehension were twofold. First, during our informal interviews, we observed that some of the participants lacked a basic understanding of how to use their Macintoshes. The reason for this dearth of basic Macintosh experience appeared to stem from a lack of training provided by the local school district. Problems and questions related to this included term abated after two months and, by the end of the study, was no longer an issue. Presumably this was due to the support the participants received from the research team coupled with their own personal growth in using a Macintosh. Second, participants had a problem understanding Internet idiom. Several participants commented about the problem they were having interacting with the Internet because they simply did not understand the language. In some cases, participants appeared to be both intimidated and intrigued with the language of the Internet. Although Internet colloquialism posed a problem for the participants, it did not deter them from using the Internet. Rather, they were enthusiastic about being able to learn a new language and immerse themselves in a new culture.

b. Three major technical problems were uncovered. First, it was discovered that the school's LAN was not sufficiently robust to support an Internet connection. A nominal network analysis uncovered unnecessary network traffic and improperly configured network hardware. The information acquired from this analysis provided us with a clearer picture of the kind of traffic being placed on the LAN and identified times of peak load. The analysis also confirmed that the Internet connection exacerbated any preexisting LAN problems by introducing a new suite of network protocols (TCP/IP) onto the network. Second, the participants' computers had a major deficiency. Their current configurations could not support the additional system overhead that was introduced when we installed the protocol support program (MacTCP) and the various Internet applications. It was discovered that the Mac LC IIs, which were the participants' workstations, needed more than 4 MB of RAM. Participants were instructed to close all unnecessary windows when using Internet applications. Some also unburdened their machines of local school programs in their quest to free up memory. Insufficient memory also created a situation where participants could not run some Internet programs concurrently with local programs.

The last technically related issue that emerged centered on technical support. Participants were extremely candid and vociferous in their comments about the designated support person for the school. They questioned his competence, and they were critical of the general lack of support and the manner in which support was delivered. Most participants agreed, however, that many of the problems associated with local support could be eliminated if the support person were adequately trained and worked full time at network management.

c. The last cover term that emerged under the domain of problems was time. In addition to their regular teaching loads, participants also were involved in extracurricular activities or had personal commitments that took precedence. For example, one participant coached the boy's golf team, which occupied his after-school time, and another was on the school planning committee and was also tutoring her students during her planning periods to help prepare them for a standardized test scheduled to be administered during the first week of March. A third subject's time was consumed with preparing science research students for the science fair scheduled in April. He also found it difficult to schedule a block of uninterrupted time, which is what he felt he needed. The problem of time was a very dominant cover term. It was difficult for the participants to find sufficiently large blocks of uninterrupted time at school for them to use their connection. It came as no surprise when they began clamoring for home access.

Domain of Usage

Internet usage by the teachers was both varied and a function of their schedules, work loads, degrees of success using Internet applications, and the relevance of the Internet resources they discovered. Eventually, a general pattern (i.e., profile) of Internet usage emerged, and concrete examples of teachers' use of Internet resources became evident.

a. In each of the four formal interviews participants were asked to identify when they used their Internet connection, how long they used it, and what applications they used most frequently. From these data, a time and applications usage profile was developed. The time profile comprised two parts—the extent of daily usage (i.e., the number of hours per day participants used the Internet) and the time of day such usage occurred. Nearly all participants began using the Internet one hour a day (as required). As the study progressed and problems waned, the participants increased the amount of time they devoted to the study to two to three hours a day. Usage was during planning periods, before or after classes, and before or after school. One participant commented, "You really need time to use it and if you are limited to a 50 minute planning period, you know, that doesn't give you much time to use it if you have other things to do."

From the data collected, it appeared that an application's "usage coefficient" was a function of one or more of the following factors: the degree of success participants had with an application, whether or not participants found the application to be beneficial, and the participants' level of adeptness in using the application. For example, if a participant met with success using Telnet during a one-week period but the next week was unsuccessful using it because of technical problems (hung sessions or machine freeze-ups), Telnet fell out of favor with the participant until he or she was once again successful in using it. Of the programs available to the participants, Eudora was singled out as the one used most frequently. Second to Eudora, the news reading program, Nuntius, was high on participants' list of favored applications.

b. The second cover term that emerged under the domain of usage was "professional." When the participants first became involved with the study, we subscribed them to the COSNDISC Listserv. Many of the participants did not find this listserv particularly beneficial. However, they were intrigued by the concept of a listserv and discovered other listservs that were more appealing. For example, one participant eventually subscribed to a literary listserv that he enjoyed immensely. Similarly, the librarian subscribed to a library-related listserv, and the ESOL teacher subscribed to an ESOL-related listserv.

Domain of Influences

Several intrinsic and extrinsic factors that influenced teachers to continue using the Internet emerged from the study:

a. Only one included term surfaced under the domain of influences that was intrinsic in nature: exciting. This term represented the aggregate of the many different words or phrases the participants used to describe their feelings, such as "exciting," "thrilling," "fun," "envy," and "curiosity." One participant said that the Internet "opened up a whole new world to me. It's very exciting with lots of possibilities and I'm thrilled to be on it. It's the most exciting thing." Another confessed that using the Internet was becoming addictive and said " It's really been a lot of fun and extremely personal and profitable. Fifteen times an hour you get to think about something new because a new question arises. You know something else? You don't have to monitor your language. You can use six-syllable words and people understand you. It's a lot like being in college, living in a college town on a college campus. You have people there who can stretch your mind. That doesn't happen in a high school classroom. It is of value to trade ideas with some Moslem in New York who is smarter than I am and I have to stretch my brain to argue with him. It's just fascinating."

b. In addition to intrinsic influences, continued Internet use by the participants was also influenced by two factors that were extrinsic in nature. First, participants reported that they were captivated by the vast expanse of resources available to them. One person claimed: "It's almost like a puzzle when you find one piece then you find another piece and then another piece and it just never seems to end. Every time I find something interesting, I wind up finding something even more interesting. . .It's like a constant Christmas morning." Another teacher said, "I try to keep telling my kids that the value of research is the stuff that you learn that you weren't looking for. When you punch up a Gopher and it lists what you can get and you didn't realize that any of that was available or even existed, well, there's a tremendous lust to go in there and see what is all there."

The second extrinsic influence that emerged was reduced isolation. Participants felt that the Internet was a source of empowerment. It enabled them to exchange ideas with their peers. One person claimed that it allowed her to "connect with so many different people," another said the Internet enabled him to be a member of the "haves and not the have nots," and a third said it provided him with the capability to "be able to tap into great brains not only in my subject matter, but in teach.ng subject matter."

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Domain of Transitions

The high school teachers involved in this study underwent several transitions that appeared to be related to their use of the Internet. They developed a more positive attitude toward education and computers and increased their self-esteem. Continued Internet use also affected the teachers' daily work schedules and the manner in which they conducted their classes. The introduction of the Internet also enabled the participants to undergo a transition from using their local school network connection to using a global connection.

a. Changes in attitudes toward education and computers were not universal. Only two of the seven participants perceived positive changes in their attitudes toward education, and only three of the seven stated that the Internet was responsible for improving their attitudes toward computers. There was no clear consensus on whether Internet usage effected changes in participants' attitudes toward education and computers. It is probable that other factors played a concomitant role with Internet usage in effecting these expressed attitudinal changes. For example, those who reported positive changes in their views of education were veteran teachers with more than twenty years of experience.

Throughout the study, participants were asked to articulate their attitudes about education and educational technology and then to describe any perceived changes in their attitudes that they attributed to the Internet. Responses from some of the participants yielded three expressed changes in attitude. First, two participants elucidated changes in their attitudes about education generally. One teacher said, "The Internet has made me aware that there are many people who are intensely interested in improving education, more than I had anticipated. . .I had assumed that we (teachers) are getting tired and giving up and that may not be the case. This has been a significant, a definite change in my perception of what my colleagues are thinking about."

Three teachers also indicated that the Internet was responsible for changes in their attitudes toward computers. One said that the Internet "made me see how wonderful my computer system was going to be. I am more intensely enthused about using my computer, no question about that. It has also changed my opinion of using hardware. I really think that every kid should have a screen." A second credited the Internet for increasing his knowledge about computers. "I've become a lot more computer literate. I know more about what's going on in computers now. I used to have a fear of crashing or hurting it. Now, I'm not afraid to experiment." The third teacher reported, "The more I use the Internet, I'm learning more how to use the computer and how to apply these applications."

The last transition in attitude that emerged was self-esteem. Responses from four of the seven participants suggested to the research team that the participants experienced a change in their self-esteem. For example, one teacher spoke about how proud he was when he posted his first message on the Internet. "At first I was afraid to post something. I was afraid of embarrassing myself; afraid of sounding dumb. When I finally did post something, I printed it and saved it because I was so proud of it. Now I'm not afraid to put my two cents in. I like showing these people how much smarter, more important, I am than they are." Another teacher also underwent a change in attitude as the study progressed. During the first three months of the study, this individual was frustrated with the lack of support from the school's network manager, and she seemed dispirited by her lack of success in using Internet applications. During the last formal interview in May, however, her confidence and self-esteem appeared to be increasing. She said, "Judy [a research team member] was having the same problems I was, so now I know it's not me or the computer. So that makes me feel better. Even on days when I get frustrated, I now sit there and try to figure the problem out and I'm finding that it's not me." A third teacher also reported that the Internet was responsible for instilling self-pride. He said, "I'm finding some personal satisfaction from the Internet. When I showed one of my students what was available and how it could help her with her term paper, she said, 'Are you kidding me?' and I said, 'No. It's all right here in the computer. All I have to do is print it out for you when you come back next week.' It's going to make me feel really good that I was able to help her. I'm finally able to do something that can help me in the classroom."

b. Two different types of behavioral changes emerged from this investigation. They were changes in participants' classroom dynamics and changes in their daily work schedules. Some of the participants reported what they perceived to be changes in their personal classroom behaviors since the Internet became accessible to them from their classrooms. For instance, one teacher stated: "I'm a little crusty, a little set in my ways. I recognize that. Change will come slowly because the stuff I do and the way I do it works pretty well for me." When asked how he envisions his role as a classroom teacher changing when he involves his students with the Internet, he said, "I'll probably be less of a dictator and more of a direction pointer." Several weeks later, during the third formal interview, this teacher mentioned that some of his students were now using the Internet and that he perceived a change in his classroom behavior. A second participant revealed that his access to the Internet "encourages me to use more cooperative education techniques and get a different structure in my classroom. I try to leave a few minutes at the end of class so I can show it to different students. I am also trying to get more students involved with research, and I am leaving five to ten minutes after class periodically so we can discuss some of the things that I found." When asked how he envisions his role as a classroom teacher changing, he reported, "I haven't chosen any new methods yet, but I want to be more of an initiator. I want to initiate a topic and then have the students discuss it. We would create some questions and then they could go and research the answers to these questions rather than looking to me for guiding them to the answers."

In addition to classroom behavioral changes, participants reported changes in their daily work schedules. These changes, which were alluded to earlier in the time-profile presentation under the usage domain, included reporting to work earlier than usual, remaining at work longer than usual, and sacrificing lunch hours. One teacher mentioned that he was "stealing time" from his classes to use the Internet, another talked about the Internet being responsible for "extending" his days, a third coined the term "doing computer time" when asked how the Internet has affected his life, a fourth teacher said she found herself putting in more time "after school," and a fifth said that she "comes in the afternoon or evening by myself to just look."

c. The last cover term that emerged under the domain of transitions was "local-to-global." As stated earlier, the target school had an installed Macintosh-based local area Ethernet network before this investigation. During the informal interviews, group meetings, and other site visits, the school's LAN was mentioned frequently by the participants and compared to the Internet. As a result, we asked the participants to tell us their story about what it was like to make the transition from a local school network that connected machines within the local high school to a network global in scope that connected machines throughout the world. One person stated: "There really isn't a transition; you just start all over. The only value of having a local network first is that familiarity with the local network makes you not afraid to jump in. Other than that there's almost no crossover." A second teacher said, "I've learned that it doesn't always work the same way. The Internet is different. There's different terminology, different techniques. It's like going from baby talk to adult language overnight." A third said that the Internet "opens you up to a lot of people." She mentioned that the transition requires both time and training. "I think I mentioned this before, but time is going to be a problem and you are going to need training." A fourth teacher's transition story focused on hard work. "You have to really apply yourself because it's a lot harder. It's not going to be easy. It's going to require work on your part. That's what the transition is going to be like." Finally, a fifth person said: "The main thing is don't keep a closed mind. If you want to learn something new or if you see something you want, then try it. It's just a matter of reading and not being afraid of the machine. The teachers that have had the most success are the ones that kept an open mind."

Implications for Educators

The information acquired from the informants of this investigation can be used by educators—including school administrators and those involved in restructuring our nation's schools—as they prepare for providing high school teachers with direct and unrestricted access to the Internet from teachers' desktop computers. The following suggestions are offered to educators who are considering establishing Internet connections at their high schools:

1. Given the problems these teachers experienced when using the Internet, educators are encouraged to

   - provide teachers with ongoing training in using their computers and give teachers user manuals and any other appropriate documentation related to their computers
   - provide teachers with Internet training that emphasizes the language of the Internet
   - ensure that teachers' Internet workstations are configured with sufficient memory, disk space, and processor speed to accommodate the system overhead that will be introduced from the Internet protocols and application software
   - perform a thorough network analysis before connecting the school LAN to the Internet to detect existing or potential problem areas and to resolve any problems uncovered from the analysis before an Internet connection is made
   - employ a full-time network manager who is capable of managing both the local network and the Internet connection
   - provide teachers with home Internet access

2. Given how and when these teachers used the Internet, educators are encouraged to

   - facilitate before-or after-school usage by providing teachers with access to the school outside normal school hours
   - reduce before-or after-school duties

- allow teachers to experiment with changes in pedagogy and changes in curricula and seek alternative methods of assessment using the Internet.

3. Given the factors that influenced these teachers' continued pursuit of using the Internet, educators are encouraged to

   - seek funding to install and maintain Internet connections at their schools and provide their teachers with adequate support mechanisms

   - provide teachers with the autonomy to seek alternative teaching methods that incorporate Internet resources into their classes

   - provide equitable Internet access to all teachers

4. Given the changes teachers perceived in themselves as a result of using the Internet, educators are encouraged to design workshops or inservice activities that would assist teachers in making a transition from lecturer to facilitator.

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Demonstration
What Can You Do While You're Waiting for the Information Superhighway?

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Key words: telecommunications, e-mail, curriculum integration, on-line activities

Abstract

Although not everyone has access to the information superhighway as yet, on-line activities can still be implemented within a school setting using minimal resources. Once computers, modems, communications software, and a phone line are in place, several options become available. For instance, an in-district bulletin board or e-mail system can be set up to support curriculum objectives, particularly those in the writing and language arts areas. Information sharing in other content areas between staff members and/or students is also possible through the use of e-mail. Practical suggestions for implementing these options, including recommendations for modem and software purchase as well as shareware communications programs will be made available to participants. Commercial services such as Delphi, Scholastic On-line, Prodigy, and America On-line will be discussed in relationship to their usefulness in a school setting. Information will be provided for all platforms—Apple IIe, Macintosh, and MS-DOS.

Demonstration
Motorcycles, Automobiles, and Traumatic Brain Injury: Taking the Distance out of Cognitive Rehabilitation Training

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Key words: ACReLAB, prescription, therapy, homebound, hospital bound, brain-injured, TBI, special education

Abstract

Injuries of the brain commonly produce cognitive deficits that result in enormous social cost. Therapy is employed to help restore cognitive capabilities and enable the injured to return to work and family life. While deficits in physical functioning are readily recognized and such recognition frequently leads to physical rehabilitation, cognitive deficits may not be recognized, may take longer to rehabilitate, and often leave residuals which disrupt productive work and family life. Telecommunications delivery of cognitive exercises into the patient's home, an extension of face-to-face efforts with the patient's therapist, helps to increase frequency of practice, may decrease the number of visits to the therapist, and may decrease the duration of therapy, reducing the total cost of rehabilitation. ACReLAB is a patented system of such in-home delivery of cognitive rehabilitation services. ACReLAB is composed of a Host Unit containing a library of rehabilitation exercises; an Individual Therapy Unit that operates from a patient's home and allows access to exercises prescribed by a therapist; Multi-User Units, typically located in hospital facilities, that allow access to the Host Unit for several patients; and an Administrative Unit through which patients are registered and prescriptions sent to the Host Unit computer. Rehabilitation professionals, typically including psychologists, occupational therapists, and speech therapists, are eligible to prescribe and utilize ACReLAB exercises. Education professionals, usually school psychologists and special education teachers, are also eligible. Collaboration with education professionals is sought for testing ACReLAB with various populations using various exercises.

Remote/Distance Education

A Degree Program Offered Entirely On-line: Does it Work?

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Key words: distance learning, adult education, CMC classroom

Abstract

This presentation describes an on-line degree program offered by the University of Phoenix. The program is supported by the Bizlink Conferencing System, which allows course work to be completed in "virtual" time. The program started in 1988 and has graduated three classes to data. Degrees offered include B.S. in Business Administration, B.A. in Management, M.B.A., and M.A. in Organization Management. This description of the program comes from my experience as a facilitator of courses in two of the programs.

Introduction

The on-line computer-based educational delivery system is an outgrowth of the technological transformation of the workplace. The University of Phoenix offers a program whose unique qualities go beyond the convenience afforded by the application of communications technology. The system fosters true group-based learning environments. Currently, the University of Phoenix offers courses leading to a B.S. in Business Administration, B.A. in Management, M.B.A., and M.A. in Organizational Management through its on-line delivery system.

The on-line campus was established in October 1988 and the first class was graduated in August 1992. On-line courses provide high-quality, responsive educational programs to working adult professionals regardless of location. At the heart of the on-line educational delivery system is a simple and flexible computer-conferencing system that facilitates learning. On-line programs and courses are mediated through a computer conferencing system that allows individual students access through their personal computers. The student completes required assignments on-line and interacts with both the instructor and other members of the on-line learning group utilizing the computer conferencing system.

All communications in the University of Phoenix on-line system are asynchronous rather than real-time communication. While this naturally imposes some limitations, it has been found that asynchronicity results in increased access for students, since they can control the time and place of their participation. They enjoy far greater flexibility, since activities need not be simultaneous. Asynchronous communication also enables both students and faculty to construct well-thought-out responses free of the pressure of instantaneous feedback. All on-line communications are computer text-based, and the students and faculty are able to maintain a common transcript of every communication.

How the Class Works

Each student is issued a private electronic mailbox (which only he or she can view), as well as a study group mailbox that is shared with study group members only. All students in the class share access, along with the instructor, to a class group mailbox. This class group mailbox provides a platform for instructor communication to the class and serves as the "main classroom" for course discussion.

The instructor sends introductory messages to all students in the class, discusses how the course will proceed, and explains the first assignments. The course materials provide this information in greater detail. From this point on, the students complete required readings and assignments off-line, and transmit completed assignments electronically. Students check the conferencing system frequently to review the information provided by the instructor, to respond to his or her questions and comments, and to discuss the material with their learning group. At the end of each week, each student provides the instructor with a summary of the major concepts learned. The students' reflection and analysis of the week's activities is a method of enabling faculty to diagnose quickly any difficulties students may be having with the material and to provide appropriate feedback and direction.

Evaluation

The University of Phoenix currently invests heavily in both academic quality and learning outcomes assessment evaluation, including a full Academic Quality Control System that features: student and faculty end-of-course surveys, comprehensive cognitive assessment, affective assessment, employer impact study, research project assessment, and longitudinal assessment of trends in student's needs. For example: The assessment of affective growth is concerned primarily with how students internalize their newly acquired knowledge and skills, and ultimately, how their learning affects their professional values and attitudes. This project assesses the degree of change in professional skills, attitudes, and self-reported behaviors known or believed to be relevant to success in professional disciplines. The students are pretested at registration and posttested at graduation.

At this point, the on-line education programs at the University of Phoenix are proving to be equally as effective (and in many cases more so) as the real-time classes taught on campus. The student response has been enthusiastic, and the faculty report an extremely high quality of interaction with the class.

Networks
The Global Education Telecommunications Network—Criteria for Successful E-mail Projects

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Key words: telecommunications, e-mail projects, curriculum, networks

Abstract

Six years ago the School of Education of the City College of New York developed the idea for an electronic mail network known as the Global Education Telecommunications Network (GETN) Project which would link ten primary and secondary schools in New York with their counterparts in London. Today our GETN project links more than 60 schools in New York with schools in 25 countries around the globe. Our network is centered around inquiry-based projects developed by teachers who are introduced to one another through the network. Teachers are not provided with predesigned projects that they complete with their classes. Instead, they negotiate with one another and identify ideas for projects that will best meet the needs of their students and fulfill their responsibilities to their curriculum.

As the project developed, we have come to realize its potential for improving teaching and learning in the New York City public schools. Giving teachers the opportunity to design their own activities spawns enormous creativity and has led to the creation of many innovative and exciting projects. These projects, in turn, help to transform often dull and lifeless classrooms into places where children are actively engaged in authentic work that they own and could share

with their partners abroad. While individual projects are important for GETN's success, even more important is what teachers are learning as a result of participating in the network and in the graduate courses that support the network. We developed our own education rationale for e-mail projects which is embodied in a set of criteria for the design of GETN projects. Some of the GETN projects include:

Fast Plant Project
Biology students in New York and Israel participated in the Fast Plant Project. Using brassica rapa seeds, students shared information concerning the 35-day life cycle of these plants. At specific days in the timetable, students in both countries simultaneously planted the seeds and were responsible for collecting and sharing the data, comparing the effects of light, temperature and water on the growth of the seedlings

Visitor's Guide to New York and London
Students went on field trips to sites around their respective cities. They researched and wrote about the places and shared the information with their counterparts via electronic mail. A publication about the sites in each city was then designed. Not only did students learn about another city, they also learned more about their own city.

City College not only created GETN, it continues to provide the ongoing support so important in sustaining GETN's network and helping it to grow. Support is provided in a variety of ways, including courses for participating teachers, on-site technical training, on-line managing and monitoring of projects, recruiting new participants and sponsoring annual conferences.

The experience of GETN teachers has consistently been that involving students in meaningful learning activities via telecommunications strengthens instruction dramatically. Students are far more motivated to read materials that they get from "colleagues" abroad and are excited about responding to them through writing. They know that their work and efforts will reach a receptive peer audience. Written work that is shared through computer networks is received in a form that can be easily read, revised, and reprinted. Instruction in academic subject areas is brought to life through student-to-student dialogues.

Telecommunications is now beginning to alter the approach to education and as the technology advances, telecommunications will play a key role in bringing the latest information to students, whether from national or international peer audiences or from the other areas on the information superhighway. It can be expected that within the next few years, with increased technological support and increased familiarity by educators, student learning will be enhanced and enriched through active involvement in real projects, resulting in personal satisfaction and improved achievement.

Teachers report that our project is exciting and motivating for students, especially in the primary grades. They help to engage learners who have been disinterested in school by providing the occasion for real, meaningful work that is owned by students and can be shared with others. We are also curious about the extent to which GETN projects promote a change in teachers' assumptions about teaching and learning, as well as changes in curriculum and instruction. We are currently investigating these questions.

Paper

Instructional Considerations in Devising a Telecommunications Network for Schools: The ORT Israel Experience

Gideon Goldstein
ORT Israel
Tel-Aviv, April 1994

Abstract

Students, teachers, administrators, and decision-makers at ORT schools in Israel are experimenting toward what will be the country's largest telecommunications system.

The system will offer electronic mail and conferencing as well as on-line databases and Internet gateways for pedagogical, research, and support programs allowing students to gain experience with the workplace of the future, and teachers to restructure their teaching methods and provide for a more cost-effective decision-making process within the network.

The presented article includes the pedagogical considerations taken into account in devising the ORT network. The several telecommunications experiments carried out by ORT in the past two years are reviewed, and conclusions are drawn.

The main focus of the article is on the most important participants of such a network: teachers and students. Several examples accompany recommendations made by the author as part of the results of a wide range of experiences.

Prologue

ORT Israel is a the largest management system for secondary and post-secondary educational institutes in Israel. It is part of ORT, the world's largest training network. Being a management system, ORT is responsible for all functions of its institutes, as well as a large portion of supervision tasks.

In Israel, ORT controls nearly 150 educational and training institutes. Sixty percent of ORT institutions in Israel are high schools. Some of these are comprehensive schools offering a wide array of selection between humanistic, vocational, and technological trends. Others are apprenticeship, vocational, or technological high schools. ORT also operates post-secondary, academic, and practical engineering programs.

ORT's decision to introduce the use of telecommunications technology was sparked by the potential it held for teachers to enhance their teaching methods and by students to acquire modern learning skills.

Other considerations were not set aside. Employing several thousand teachers and educators and hundreds of administrative staff, ORT clearly needed a modern telecommunication system. Having its institutions spread over the entirety of Israel's four-hundred mile length emphasizes the potential of a system in streamlining services, cost-effective reporting, teacher training and support, and several other dimensions.

Realizing this potential, ORT has made several experiments in the use of telecommunications. Undergoing an extensive, complex, and controlled decision-making process, we have reviewed the several hardware, software, administrative, and pedagogical issues intertwined in constructing a system that would best suit the needs of a large education and training organization.

This article will focus, as ORT has, on the educational considerations of putting together a telecommunications system. The three major applications—electronic mail, conferencing, and the use of on-line databases—will be discussed.

Implementing innovations in the educational process involves two very cardinal groups: the teachers and their students. Adhering to this traditional dichotomy, we will discuss the roles of each.

The implications of telecommunications for the teacher are varied. The most important changes are in teaching methods and techniques. I will also discuss motivational factors as well as new possibilities of teacher training and teacher support.

Conventional, traditional methods place the teacher at the front of the classroom, orating to a complement of young students and adopting the role of "the sage on the stage." Telecommunications offer a multidimensional change by metaphorically positioning the teacher as "the guide on the side." An examination of these dimensions clarifies the importance of the role change.

The First Dimension—Information Access

The amount of information in most of the subjects taught in schools worldwide is currently doubling every three to five years. Any informational textbook, reference book, or encyclopedia is outdated by the time it leaves the printer. The updating of these resources is painstakingly slow and most times futile.

The use of telecommunications offers new realms of information access. Thus the teacher of today can rarely be the sole source of knowledge for his students. Accepting this, the teacher must modify his or her role to cope with the influx of data better. The teacher has to become a mediator between the information and the students. His sources of information can no longer rely solely on text or reference books.

Electronic mail allows students to reach beyond the four walls of the classroom. ORT students have been communicating with students around the world. As part of the International Education and Resources Network (I*EARN), our pupils can request, contribute, and share information with students in Australia, the People's Republic of China, Russia, Spain, Argentina, The United States, Canada, and other countries.

Using these opportunities, our students are able to research the cost of living around the world by comparing prices of various commodities with their international partners, thus contributing in an unprecedented fashion to their economics curriculum. Others are able to collaboratively study the similarities of the wildlife in the Israel desert as compared to the New Mexico terrain.

Results of weather measurements, ozone depletion, air and water pollution, regularly monitored and reported by students around the globe, provide an essential source of relevant information, unavailable in any other instances.

Many networks host several electronic conferences on a wide array of topics. These conferences, usually held by special interest groups, provide a limitless wealth of information. ORT students have read otherwise inaccessible information on human rights from Amnesty International conferences. They were able to track firsthand the progress of the world summit on ecology in Brazil by reviewing others. The list will get longer, as we plan to offer Internet access.

Marshall McLuhan's Global Village vision has come true. Electronic media are disseminating and being accessed by young people at an unprecedented rate. The advent of cable television and satellite transmissions exposes our students to immense amounts of information. New sources of information are within the electronic media. Besides radio and television, electronic on-line databases are being made accessible to students.

The mere retrieval of electronic information is worse than the needle in the haystack. New skills are required to identify the relevant sources of information and then logically scan databases and retrieve required information. These skills are different from those that our students use today. The students need to develop a comprehensive disciplinary vocabulary; without that the attempt to search electronic databases will prove futile. Another necessary skill is the mastering of database work. Record structure, field names, and field contents are some of the terms, Boolean searching and indexing are just a few of the skills required to use on-line databases.

ORT high schools in Israel have been experimenting with the use of on-line databases. Following a special curriculum put together by Dialog Information Services in conjunction with its "ClassMate" classroom instruction project, students are using database search results as an auxiliary means of information for their learning process. One of our students completing a paper on the effect of various greenhouse polymers on plant growth used relevant databases and was amazed to find that many of the global information sources discussing this topic are based in Israel. Another girl, researching a hereditary genetic defect that she personally suffered, was able to surprise her physician with news of a very new medication—so new that it had yet to be published in paper format.

The successful use of these new possibilities lies with the teachers. Only their cooperation in shifting their focus from that of information giver to that of facilitator between their students and the accumulating knowledge will bring tomorrow into the classroom. This change, like many others we will discuss, demands careful preparation, articulate curricular adjustments, resources for teacher training, and much coaxing. Our experience in these matters will be further discussed.

The Second Dimension—Methodical restructuring

The shift of the teacher from the stage to the sidelines of the classroom is only the first part of the change imposed by the integration of telecommunications into the learning environment.

Whereas frontal teaching was and still is the most popular instructional method in schools, the use of computer technology at large and telecommunications specifically poses challenges that demand a different set of teaching methodologies.

The objectives for the use of electronic mail for instructional purposes at ORT schools in Israel are concentrated in cooperative learning. Teachers and students work hand in hand with their foreign and domestic counterparts. The attempt to share information handed down in frontal methods by the teachers quickly proves counterproductive and time-wasting. The need for change in learning techniques is evident.

Our experiences in collaborative learning projects on I*EARN and the use of on-line databases have led us to concentrate on four methods that are suitable for such projects:

1. ***Research.*** Both quantitative and qualitative, field and text, in the various sciences and humanities. Last year Israeli students collaborated with Spanish counterparts, using e-mail while researching the causes for the expulsion of the Jewish people from Spain in 1492. Since the students lacked shared textbooks, some of the information used was a result of database searches.

2. ***Creativity.*** Fiction and prose, art and music. This year ORT students will contribute to an international literary magazine. The editing process is all done through electronic conferencing. We are currently trying to share multimedia through telecommunications.

3. ***Experiment.*** Whether in the sciences or in technological studies, collaborative experimentation is needed to compare phenomena. For very practical reasons, our students have been busy experimenting with the transmission of binary and compressed computer files as well as sharing those files, on various computing platforms.

4. ***Development.*** Using electronic mail to share development questions, one of our students was able to develop an off-line-reader which will be an integral part of the proposed ORT network.

The implementation of the above has an additional effect on the role of the teacher. The proposed methods warrant students working individually or in small group. The teacher adopting these methods is required to change the way of working with students. Project teachers at ORT adapt their time in class to small-group work and become methodical experts, teaching relevant disciplinary tools instead of raw information. One of the project teachers replaced his textbook teaching in his environment class with research tools. He coached the students on how to ask the right questions, collect the needed data, assess their results, and draw the conclusions. His Boston counterpart did exactly the same with his students.

Using these methods proved very useful for bridging curricular discrepancies across boundaries.

The Third Dimension—Differential Learning.
Creating the setting for young people to collaborate using telecommunications has opened yet another facet much needed in learning environments. Shattering traditional concepts by having the teacher act as a mediator, using open-ended methods such as research, and allowing for individual or small-group work provides for differentiation in learning tasks.

The true meaning of this is that students in a classroom can, within the confines of a set curriculum, use different methods, at various cognitive levels to explore several aspects of the same subject.

An international task group of teachers is currently developing a curriculum for teaching the Holocaust and genocidal acts in World War II by implementing a differential approach. Students will use an electronic conference to hand in assignments. These could be historical summaries, research findings based on interviews, literary reviews, and original contributions in any form of creativity. The topic was divided into subtopics, and each student may choose one that he prefers. The conference will include students of various ages in several parts of the world with different ethnic backgrounds. The differential tasks will allow participants to tailor-fit their own learning pattern, a long-coveted objective for Israeli teachers.

The Student Dimension—The Future Workplace.
Although teachers are the most important factor in restructuring instruction, introducing change has much to do with student motivation. When ORT decided to examine telecommunications, we selected a marketing approach. All intended participants were exposed to short- and long-term advantages included in their consent to join the various telecom-based projects.

The major advantage for students, as we perceived it, was the simulation it would pose for the optimal future workplace. Besides the advantages described earlier in this composition, we considered the following components:

1. *Technology.* Electronic mail, conferencing, on-line databases are all part of current hi-tech, high-status workplaces. We offered our students the possibility to enjoy hands-on experience with the technology used by IBM and Digital, by Harvard, Oxford, and the Weizman Institute, by Wall Street brokers and Chase Manhattan Bank. Students were given the option to go to any extent of the use of the technology. All were compelled to use a text editor and understand how a modem and telecommunications software worked. Those who requested it went through the whole course. At present, 50 percent of participating schools have students doing all the telecommunications.

2. *Language.* With a united Europe, a growing market in the former Soviet republics, and Israel's close ties with North America, we had forgone the option of using translation to and from Hebrew to assist students in correspondence. A preliminary requirement was that all communications be carried out in a foreign language. Teachers were instructed to concentrate on content rather than form, and students were given extra language support. When they arrive at their future workplace, a large majority of our students will have to research, market, develop, and consume in foreign languages. The acquired skills will no doubt be an asset.

3. *Collaboration*. In an age of information, professionals in all disciplines acquire expertise in very concise and well-defined fields. It is almost impossible to carry out professional research with the person in the next room. Many international organizations as well as academic institutes allow for distance research and development. The cooperation skills acquired by our students through their distance learning work will give them a head start in their future professional pursuits.

4. *Professional work tools.* Using the various learning methods described earlier, our students experience what is expected of them as university students, professional researchers, technological developers, or artists. The individual or small-group work, sometimes in inter-disciplinary teams, gives the young people a true sense of achievement.

Students were also given affective channels. An international youth conference was set up. Facilitated by an Israeli student and joined by scores of participants the world over, the I*EARN youth forum is an informal meeting place for students. Political issues, dating, heav; metal and the environment are all up for discussion.

Israeli pupils of ORT were also given an exceptional opportunity to represent their country when, during the war in the Persian Gulf, a special electronic conference was set up. Being closest to the action and the victims of dozens of Scud missiles, ORT students played an important role in letting their global community know what was happening.

The Dimensi·n of Support—Helping the Teachers

Marketing c· ange to teachers is a difficult task. True to our commitment, we approached the teachers by ··ointing out the benefits they might find in implementing telecommunications and the restructu.·ing it might require in their work.

ORT teachers are confronted with a two-part plan: intrinsic compensation and extensive support. We are experimenting with two types of teacher support, on- and off-line.

All teachers who were taking part in ORT pedagogic telecommunications ventures and who were willing to restructure their instruction methods received the following support:

1. ***Technical support.*** Beyond using a text editor to review student work, teachers were not expected to use either the modem or the telecommunications software.

2. ***Language support.*** English teachers were recruited to assist teachers in proofreading student contributions and in forming disciplinary vocabulary for use by subject matter teachers.

3. ***Curricular support.*** All participating teachers received full assistance in transforming existing curricula to telecommunications-integrated ones. Teachers offering new or extra curricular courses received assistance in curricular considerations.

ORT teachers are also offered an on-line support system. Special teacher groups use telecommunications to enhance their teaching. These teachers use electronic mail and conferencing as an alternative to physical gatherings. This saves time and money and allows teachers to do their telecom chores at their leisure. Since these teachers have joined ORT telecommunications projects that h: e nothing to do with their students, they are required to do all telecommunications chores by themselves. This does pose severe problems for which I hope to offer our proposed solutions later in this article.

All-teacher telecom activities at ORT include the following:

1. ***Peer-to-peer electronic mail.*** With this availability teachers with special interests can correspond on a personal basis. Besides being an affective benefit, this is constructive for teacher's use of telecommunications and to their professional capabilities.

2. ***Peer-to-peer electronic conferencing.*** ORT has set up over a dozen experimental special-interest cross section groups. These groups enjoy a dedicated conference to discuss instructional issues.

3. ***Expert-to-peer telecommunications ventures.*** Experts who are either otherwise inaccessible or are very expensive, offer assistance to ORT teachers on-line. The experts will either facilitate a special conference or answer questions using a listserve.

4. **Database access.** Teachers requesting database use are offered both free on-line search time and technical assistance. Last year, two ORT high school students reversed roles with their teachers. Setting up a computer and modem in the teachers' lounge, the students introduced database use to teachers.

Searching for intrinsic benefits to offer teachers, we deployed a series of experiments, at the end of which we concluded that personal professional status is a good place to start. Many teachers doing postgraduate degrees are interested in using databases for their theses. We offer such teachers unlimited access to databases. Using the collaborative learning projects, teachers showed interest in having students act as their research assistants. Under experiment currently is a teacher-initiated research project, the findings of which will assist the teacher in substantiating her own postgraduate work.

The Puzzle Dimension—Putting the Pieces Together.

The telecommunications ventures described so far form the stepping stones for the ORT Israel network. In the decision-making process now at its last stage, ORT Israel has deliberated the consequences of the aforementioned experimental projects.

Since the network will serve various groups within ORT, it will have to offer flexibility and ease of use. Following are some of the decisions made by ORT Israel in the construction of its support network that are relevant to instructional aspects:

1. ***Conference structure.*** After extensive research we decided to select a conferencing system that allows for a topic-and-response structure. While most networks offer a conference that comprise a one-dimensional matrix that fills up according to chronological order of contributions, ORT has decided to use a conferencing system devised by the Association for Progressive Communications. This system has a hierarchical structure, which we consider best for pedagogical objectives.

2. ***Language interface.*** ORT will offer a bilingual user interface at the BBS level. Users who select domestic use will enjoy a Hebrew set of menus, while those requiring international access will use an English interface.

3. ***Off line solutions.*** For participants who do not wish to fuss with direct communications, ORT has developed, with the aid of one of its graduates, a set of readers for off-line use. These readers will allow a school to set up a mock BBS on a LAN or a stand-alone computer. Users having mailboxes on the local school system will handle their external mail and conferencing as well as database search requests through an identical interface as the one on the ORT host. At set intervals the local system will dial the host and do all necessary exchanges for local users. Another option will include a reader for an individual to work with on his home computer using diskettes up- and downloaded from the local school computer.

4. ***Gateways.*** We find it essential for several purposes to offer users gateways to other networks. BitNet (EARN) and popular European and U.S. networks are high on the list.

5. *Professional facilitation.* Past and present experience proves that telecommunication activities such as collaborative study programs and teacher support conferences require professional facilitation. ORT will train senior educators in the skills required to mentor such activities.

6. *No time pressure.* The use of new technologies may be menacing to some people. It is essential that teachers are allowed as much time on-line as needed to toy around. ORT will allow teachers to use the system free of charge, with no limits. ORT will cover all expenses for teachers to compensate them for their efforts in joining.

7. *Use of students.* ORT will place much of the technological responsibilities on teacher-guided students. The assumption of responsibilities by these students allows for better identification and motivation.

Epilogue.

Telecommunications have grasped a strong foothold in education and training systems. The use of this new technology demands several resources allocated to the pedagogical aspects.

Teacher training and support are most important. We found that students can be excellent technical assistants, for they have a better and quicker grasp of the technology. For this role reversal to work well, teachers need motivational preparation but its products are extraordinary.

Teachers are also vulnerable in the introduction of new technologies. When these technologies carry a message of restructuring the things teachers already know how to do best, it is essential that ample support be provided.

The technology itself is not as important as the educational product. When the technology is the highest preference only a few will participate. When the use of the technology takes precedence, participation will increase.

The experience gained by ORT in its telecommunications experiments led to the near future establishment of what will be the largest non-academic education and training network in Israel. In coming years we will be able to offer research findings to address many questions that were raised in this article but received only partial answers.

About the Author:

Gideon Goldstein was born in Haifa Israel on January 16, 1951. A graduate of the Tel-Aviv University Law School, he wandered into education by chance and decided to stay.

*For the past ten years Mr. Goldstein has specialized in curricular integration of computer applications. He has held posts with the Ministry of Education and Culture and ORT in Israel. He also holds the position of the Israel center coordinator for the International Education and Resource Network (I*EARN).*

He has experience in courseware development and multimedia.

Mr. Goldstein served as co-chair for the first International Symposium for Telecommunications in Education, Jerusalem, 1989, and he was a founding member of the SIG-TEL of the ISTE (ICCE).

Math/Science

Technology-Assisted Science Curriculum: Teaching and Learning with the Internet

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Key words: Internet, science, preservice, inservice, partnership

Abstract

Project "Teaching and Learning with the Internet" is a partnership of teachers of science, preservice teachers taking an educational technology course and a science methods course simultaneously, and university content specialists in science and educational technology. Presentation will outline the project and report on its first phase.

Introduction

Students in the teacher education program of the Center for Excellence in Education (CEE) at Northern Arizona University (NAU) are required to take a three hour educational technology course, but many report back to the university that they student-teach in classrooms where technology is not used. The center also maintains an initiative to integrate technology into all courses. To combine the need for providing technology-supported instruction in the student teaching experience, and to further the efforts for inclusion of technology in courses, the "Teaching and Learning with the Internet" project was initiated. CEE is participating in the grant-funded project for the 1994-95 school year with twenty K-12 teachers of science, twenty preservice teachers taking an educational technology course and a science methods course, and university content area specialists in science and educational technology. Teachers from three schools in the northern Arizona region have been identified, and in Phase I of the project, these teachers are attending weekend seminars to learn to use the Internet to support science instruction.

Phase I: Inservice Teacher and University Partners

The three schools identified for this project include a small rural school, a larger school district in an urban setting, and a remote school on the Navajo/Nambé reservation. These teachers are learning to use the Internet for communication within the group via electronic mail and also are becoming familiar with science resources available on the Internet during Phase I, taking place during the Fall 1994 semester. Seminars, taught by an educational technology faculty member, as well as science content faculty, also carry optional university credit. Teachers meet in the CEE technology lab on Friday evenings and Saturday all day once each month during the fall semester for intensive instruction and practice.

Phase II: Preservice and Inservice Partnerships

Phase II, forming preservice and inservice partnerships in preparation for student teaching, will take place during the Spring 1995 semester. Twenty students in their last semester before student teaching have been identified and will take an educational technology course and a science methods course simultaneously in a block format, which will allow team teaching and combined assignments utilizing the Internet and electronic mail. Preservice students will accompany the educational technology faculty to visit participant sites for observations of science classrooms using the Internet and for team teaching with the inservice teachers. Eventually students will be placed in these same classrooms for their student teaching experience. Through building an electronic and classroom partnership with university students and teachers in the field, CEE hopes to create ongoing partnerships that extend beyond the university experience and result in teachers at all levels—preservice, inservice, and university—developing technology-supported curriculum.

Literacy

Preparing for Tomorrow Today: Electronic Resources for Information Literacy

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Key words: conferencing, databases, information literacy, Internet, multimedia, resource-based learning

Abstract

Beyond the basic skills of reading and arithmetic, the citizen/worker of the 21st century will need complex analytical skills. The technological tools of the Information Age—computer networks, telecommunications systems, and databases—have put an unprecedented volume of information at our fingertips; yet how aware are we of what is available, when to use it, and how to find out about it?

From restructuring the learning process to reflect the use of information in the real world to changing the role of the teacher from presenter of prefabricated facts to facilitator of active learning, education systems and institutions must take seriously the challenges of the Information Age.

For many years educators have heard about a variety of literacies—print, visual, computational, cultural, computer, scientific—and their importance in every child's education. Each of the literacies prescribes a process by which the learner can more easily negotiate the content unique

to a particular area of study, like mathematics or visual media. Each of the literacies operates in isolation, and each has its own vocabulary and conventions for study. Information literacy, on the other hand, encompasses all of the other literacies and is a component part of two more general competencies that all learners need to study any discipline, communication and critical thinking.

Briefly defined, information literacy is an individual's ability to:

- *recognize a need for information*
- *identify and locate appropriate information sources*
- *know how to gain access to the information contained in those sources*
- *evaluate the quality of information obtained*
- *organize the information,*
- *use the information effectively*

Alternately called "active learning" or "resource–based learning," information literacy programs encourage shifts in the roles of teachers and learners. Such shifts are essential to prepare learners to live and work in an information–centered society.

In a resource–based learning environment, students and teachers make decisions about appropriate sources of information and how to access them. Aside from more traditional print resources (e.g., textbooks, encyclopedias, newspapers, magazines), they use electronic resources such as video and videodisc, software tools, and simulation/modeling tools. In addition, they use computer networking and telecommunications for both data access and participation in learning communities. They use multimedia technology as materials for gathering data and as production tools.

Teachers trying to create an information-literate learning environment for their students have given up the view that teaching is telling, that learning is absorbing, and that knowledge is static. They constantly make difficult choices about old curriculums, examining subject-area requirements closely, setting priorities, and considering process as well as content. They involve students in complex tasks which have purposes beyond the limits of the classroom and the teacher's critical evaluation. They also create collaborative situations to develop students' social skills and problem-solving skills. They are familiar with a variety of learning tools, both print-based and electronic, and they encourage their students to move beyond the textbook when seeking information and solving problems.

This session will introduce participants to the concept of information literacy and to electronic services from ASCD which support resource-based learning.

The Association for Supervision and Curriculum Development (ASCD) has responded to educators' needs for a variety of resources as they engage students in active learning. The following listing of materials includes stand-alone tools for educators as well as collected descriptions of the multitude of people, materials, and programs that are available from a wide range of sources:

> ***Electronic chalkboard.*** *This multimedia authoring tool was designed for use by teachers and students to develop multimedia lesson plans, portfolio entries and presentations, and*

assessment activities. It allows the user to integrate sound, images, text, create bar-codes, and dynamically link elements, using a very simple graphic interface.

Only the best*. This cumulative, disk-based resource organizes descriptions of highest-rated education software and multimedia products evaluated from 1985 to 1994 into nine fields, including publisher, title, curriculum area, grade level, and hardware required. It includes database and word processing files for* Microsoft Works *and allows sorting and searching using words, phrases, and Boolean logic. Additional files include complete publisher information, a "special education" products file, and an alert describing promising new software titles.*

Internet node. *ASCD has expanded its services to educators to include materials and information available on the Internet. From "Gopher" to "listserv" to "FTP" to "WWW" capabilities, ASCD offers resources of interest to educators who travel in Cyberspace.*

"ASCD On-line" on America On-line*. This commercial service provides information to over 800,000 households for a monthly subscription fee and connect-time charges. ASCD participates as an information provider in the "Learning and Reference" department, joining the National Geographic Society, the Smithsonian Institution, the National Education Association, and others. "ASCD On-line" is updated regularly with articles from a variety of publications, with responses to queries from subscribers about education issues and with product and consortium support activities.*

Contact ASCD for more information about any of these resources.

Policy

Managing Chaos: Student Navigators on the Internet

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Key words: students, Internet, K-12

Abstract

Two seasoned teachers examine the issues that must be addressed before unleashing student accounts on the Internet. Initially, schools develop an Acceptable Use Policy and then instruct students on the fine points of ethics and etiquette on the Internet. However, new issues arise as these students tap into the resources while in the library, at home, or within the classroom setting.

Some of the issues are listed below:

- ***Account Management.*** *Should every student have an account?*
- ***Budgets.*** *How do I manage costs with so many users?*
- ***Censorship.*** *Should students have access to all the resources on the Internet?*
- ***Security.*** *Are student accounts private? How can the other information on a host account be protected?*
- ***Hacking.*** *What are the dangers of student hackers?*
- ***Training.*** *What do novice, intermediate, and expert student users need to know and how do they learn it?*
- ***Research.*** *What information-processing skills can students learn?*
- ***Classroom Management.*** *What is needed to successfully integrate telecommunications activities and resources into the curriculum?*
- ***Gender Bias.*** *How do female and male students view and use the network differently?*

Two perspectives address these current issues. One teacher/librarian gives his student navigators individual accounts for use at school and at home. Another teacher/computer coordinator manages her students in a classroom setting and with specific curriculum-based projects. Together they examine the resources available for addressing these issues and present solutions they have found for managing student navigators.

Policy

The "Electronic Emissary": Bringing Subject-Matter Experts to K-12 Classrooms

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Key words: Internet, electronic mail, subject-matter experts, questioning

Abstract

The Electronic Emissary is a type of Internet-based interpersonal resource that is currently under development. The Emissary is a "matching service" that helps teachers locate other Internet account holders who are experts in different disciplines, for purposes of setting up curriculum-based electronic exchanges between the experts and their students. Several examples of possible exchanges follow.

- *A class studying South America could learn about recent global environmental research results from a scientist who studies rain forest deforestation in Brazil.*
- *A class studying geometry might "talk" electronically with Euclid, who is actually a mathematics professor.*
- *A class studying the future of education might converse with an emerging technologies specialist from California's Silicon Valley.*
- *A class studying American history might electronically interview Harry Truman, who is really a curator with the National Archives.*
- *A class exploring the rapidly changing governmental structures that are emerging in what was once the Soviet Union might correspond with a group of graduate political science students at a university in the CIS.*
- *A class reading* Huckleberry Finn *might correspond with an African-American studies scholar about the repercussions resulting from the enacting of the Emancipation Proclamation.*

During the spring semester of 1993, with support from the Texas Center for Educational Technology (TCET) and the University of Texas at Austin, a prototype of the Electronic Emissary service was field-tested with approximately 30 classroom-expert teams. During the spring semester of 1994, the project was revised and expanded, joining and assisting approximately 55 more teams. During these periods, volunteer participants sent and received electronic mail to and from each other through a central point on the TCET educational research server, so that copies of all project-related messages could be retained for study by Emissary coordinators. Each expert-classroom team had a unique project address on the TCET server. The Emissary Unix scripts that were executed when electronic mail was delivered to the project addresses on the server automatically copied, sorted, stored, and forwarded project-related messages, and generated usage data, such as number of messages sent in specified time periods and message lengths.

Volunteers for all of the teams were solicited through announcements posted to selected listserv groups (subject-specific electronic mail distribution lists) and statewide or international

newsgroups. At the completion of each of the collaborative projects, each team was asked to write a short summary of the project's goals, procedures, outcomes, and applicable suggestions for other electronic collaborators. These summaries have been posted in the Emissary file archive, making them freely available to interested Internet users.

An interactively accessible, searchable on-line database has been created and beta-tested so that similar "matching services" can be offered to a larger number of classrooms with teachers who have access to the Internet. This database automatically accepts, sorts, and stores requests for collaboration from classroom teachers and offers of expertise sharing from researchers, businesspersons, community service workers, according to topic descriptors. If sufficient and other funding is procured for the project, these services will be made available to increasingly larger numbers of teachers with Internet accounts during future academic semesters.

During this project presentation, the ongoing Emissary project will be described, an update on matching services available will be given, and preliminary results of research on asynchronous communication among adults and children will be summarized.

Project
A Model for School, Corporate, and Research Partnerships: Project Explore in Union City, New Jersey

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Key words: educational telecommunications projects, community telecommunications, telecommunications and curriculum , teacher development

Abstract

This session will present an account of a specific experience of developing on-line use of the computer as an integral part of the curriculum for seventh-grade students, as a result of collaboration among Bell Atlantic, the Center for Children and Technology, and Christopher Columbus Junior High School. Discussion will touch on the complexities of creating a sophisticated array of multimedia and networked resources within a school community.

As technology advances more and more into classrooms across the United States, it is important to stand back and take stock of the effects that the fast advance of technology is having on learning and teaching. Project Explore offers a unique opportunity to view the connection between the development of learning and technology in a junior high school program in an inner city school. Union City is located in the most urbanized area of the country. Its student population is 97% Latino, many families having recently arrived in the United States. Schools in Union City have a history of student transience, with families moving from school to school or out of the district. This population is often the last to receive the benefits of technology.

Bell Atlantic made a decision to invest its time, money, and expertise in Christopher Columbus Junior High School in Union City. Bell Atlantic installed more than two hundred 486 computers in the home of every seventh-grade student, every teacher, and administrator and all classrooms in the school. The computers are connected through an ISDN network, which is connected to a Lotus Notes Server. The LAN is also connected to the Internet. The school district, in collaboration with Bell Atlantic and the Center for Children and Technology, committed itself to supporting teachers in learning to use the new technology. The result has been a year in which students, teachers, administrators, and parents have struggled to learn how to get on-line and how to communicate with each other. Along the way, they have made fascinating discoveries and learned from one another, about attitudes toward learning, about curriculum, and about inclusion.

The widespread introduction of computers in Columbus Junior High School has had far-reaching effects on the school population, including reduced transience, increased parent involvement in the school, and increased collaboration among the staff. During the second phase of the project, the plan is to create a server-based network of resources, including laser and CD-ROM materials.

Panel Participants

***John Grady**, the project director from Bell Atlantic Video Services, will talk about building the technological infrastructure for supporting schools.*

Robert Fazio, the principal of Christopher Columbus Junior High School, who helped to design and create the school as a media mecca, will talk about the day-to-day working with children and teachers in order to facilitate the fullest use of technology and the various impacts of this technology on the school community.

Andy Henriquez, a research associate at the Center for Children and Technology and a former elementary school teacher in New York City, will discuss the history of his work with teachers at Christopher Columbus.

Bruce Kanze, a consultant from the Center for Children and Technology and also a former New York City elementary school teacher, will discuss curriculum development and building a bridge for teachers to use the technology.

Paper
Special Education Training for Correctional Educators Using Audio- and Computer-Conferencing

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Key words: audio-conferencing, computer-conferencing, workplace training, correctional education, special education, collaborative problem solving

Abstract
This study compares the effectiveness of audio- and computer-conferencing in delivering workplace training in special education to educators in correctional facilities throughout New Mexico and Arizona.

Introduction
In January 1994 the University of New Mexico began a research project that compared the effectiveness of workplace training over audio- and computer-conferencing in 18 correctional facilities in New Mexico and Arizona. The purpose of the research, which lasted six months, was to investigate how a telecommunications system featuring synchronous (live) audio conferences fared when compared to asynchronous (delayed) computer conferences in delivering a graduate course to correctional educators. The training content was specifically designed to address the educators' unique responsibilities and work circumstances and incorporated a student-directed collaborative problem-solving approach.

Too often the expertise and knowledge of educators and professionals targeted for training are overlooked when that training is designed and presented in the workplace. The research conducted by Kirby & Boak (1987), Hiltz(1990), and Henri (1989) demonstrates the ability of audio and computer conferences to allow a collective process wherein the knowledge and experience of learners are incorporated in the training. However, the ability of conferencing to allow for interaction and networking does not necessarily suggest that "effective learning" will be automatic. Rather, it is the interactive structure of the group and the nature of the training activities that facilitate learning in a collaborative mode.

Hiltz (1988) describes the essence of collaborative learning as knowledge that emerges from active dialogue among those who are seeking to understand and apply concepts and techniques. Continuous access to teleconferencing in the workplace contributes to its learning potential.

When an individual gets an answer through conferencing, it can be immediately applied in the work situation that stimulated the question. Through the exchange of interventions and interactions, participants become actively involved in a dynamic and growing course content.

While findings confirm the efficiency of audio and computer conferencing, the means whereby educators can use the technology effectively to support learning have only recently been identified.

Background

Currently, correctional facilities in the United States detain a collective population of some 1.1 million men, women, and youth (Bureau of Justice Statistics, 1992). More than 400,000 (40%) of the incarcerated population are believed to exhibit some handicapping condition (Coffey, Procopiow & Miller, 1989). In 1987 a review of the literature by the Institute on Mental Disability and the Law suggested that approximately 50% of youths in correctional settings have a disability that may qualify them for special education services (Power-Cluver & Yaryan, 1992). In 1991, Rutherford indicated that nationally, 40% to 60% of juveniles in correctional facilities had received special education when enrolled in public schools.

Federal legislation mandates individualized and appropriate education for all students with disabilities through age 21, even when they are imprisoned. Section 504 of the Vocational Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 prohibit discrimination based on disability for individuals of all ages. However, most of the adult inmates needing special education are not served at all; juveniles, if they are served, receive marginal or inadequate services (Rutherford, Nelson, & Wolford, 1985).

One major stumbling block in implementing the legislation in correctional settings has been the difficulty in finding and hiring qualified special educators (Nelson, 1987; Leone, 1986). Nearly twenty years after the passage of P.L. 94-142, only five states can claim partial compliance with the law in their correctional facilities (Eggleston, 1990). Data indicate that there is less than one special education professional per correctional institution in this country (Rutherford, 1991).

A cadre of trained special education personnel is needed to implement the law within these specialized settings and to advocate and develop, as necessary, interagency agreements for appropriate services. Well-structured, well-planned inservice and preservice training programs in special education for correctional educators seem to be the most feasible means to improve instruction to inmates with disabilities. However, New Mexico's prison facilities (typical of most correctional facilities in the U.S.) are spread across a wide geographical area, often in isolated rural settings. This factor makes it difficult for correctional educators to travel to training sessions and for trainers to visit these facilities. Educators in these facilities have very few opportunities to share their classroom expertise or concerns with one another and have limited access to resource centers or materials.

O'Connor and Rotatori (1987) and Pelton (1983) argue that upgrading the skills of teachers and improving the quality of educational programs in isolated settings will require universities to change the manner in which they structure and deliver training to personnel already teaching. Knapczyk (1991, 1989) states that the inaccessibility of training opportunities is a major factor in ineffective educational services in isolated areas. He espoused *distance education* as a viable format for reaching these settings.

In 1989, in an article titled "The Evolution of Distance Education," Dede introduced the concept of *technology-mediated interactive learning (TMIL)*. explaining that TMIL might include geographically isolated learners communicating and working cooperatively through instructionally oriented distance education technology; the Virtual Classroom project at the New Jersey Institute of Technology and the InterCultural Learning Network were given as examples. Dede proposed that telecommunications technology could provide tools and experiences to enhance the collective learning of participants as well as their individual accomplishments. In 1991, Knapczyk reported that *collaborative learning* supported by telecommunication technologies created unique opportunities for teacher training in isolated communities. This combination of collaboration and distance education seems equally applicable to personnel teaching in correctional facilities. Telecommunications technologies are currently being used to deliver distance education courses to prisoners in various correctional settings across the United States, Australia, and Europe (Daddario, 1988; Langenbach et al., 1990; Richardson, 1989). However, unlike other countries (e.g., Australia, England, and Wales), the United States' utilization of telecommunication technologies has not been extended to provide training or educational programs to correctional educators.

The provision of two-way interaction intrinsic to teleconferencing can offer inservice training to correctional educators while affording them an opportunity to interact with their instructors, with fellow educators at the same and distance sites, and with outside professionals and databases, library resources, and educational centers (local and distant). Azarmaza (1987) argued that teleconferencing had great potential for increasing the effectiveness, productivity, efficiency, and availability of instruction while assuring cost-effectiveness and saving time. Gunawardena (1990) proposed that teleconferencing could make a significant contribution to education by delivering current and critical information to specialized groups such as doctors, nurses, engineers, and teachers scattered over vast geographical areas.

Universities worldwide have been developing courses experimenting with different combinations of audio and computer technology. A review of the literature reveals that either of the distance education media can successfully support varied teaching tasks. Wong(1989) pointed out that when one medium is compared to another for effectiveness of instruction, no significant differences are found. She reported that more variance is found *within* than *between* media, and concluded that *how* a medium is used in the educational process may be more important than *what* medium is used. Less often mentioned in the literature is how distance education media can simultaneously support independent and interactive learning and whether learners prefer or perform more efficiently with *live* versus *delayed* delivery. All delivery options should be considered in order best to serve isolated professionals in the workplace who need relevant information, training, and access to their peers.

Course Description
Before correctional educators can offer an "equal" education to incarcerated individuals with disabilities, they themselves need information and training in special education. A course entitled "Teaching the Special Needs Learner in Correctional Education" was designed by the author and Dr. Eggleston (a correctional/special educator from California State University-San Bernardino) specifically for correctional educators, using teleconferencing technology. The author and Dr. Eggleston team-taught the course electronically from New Mexico and California, respectively.

Electronic staff classrooms were established in New Mexico's and Arizona's correctional facilities, including adult prisons (male and female), juvenile detention centers, county jails, public school detention homes, juvenile and adult diagnostic and development centers, psychiatric treatment centers, and the New Mexico Department of Corrections' training academy. The course was offered for graduate or undergraduate credit (3 credit hours) and lasted one semester.

The objective of the course was to offer correctional educators an opportunity to try out special education classroom strategies, develop a deeper awareness/understanding of the nature of disabilities, form a network of colleagues, mentors, and field experts, and interact with other agencies in order to achieve a more successful effect on the education/rehabilitation of their students. The course ran for sixteen weeks.

The first six weeks of the course were dedicated to learning the conferencing technology. Participants on both audio and computer systems joined mock conferences, set up their own conferences, and sent messages electronically. The seventh week of the class was directed at the laws and other legal issues concerning individuals with disabilities and the difficulties of implementing special education in the correctional facilities. The remaining nine weeks were divided equally into the following disability categories: mental illness/behavior disorders, mental retardation, and learning disabilities.

The correctional educators in both the juvenile and the adult facilities received the course during the regular work day as part of their scheduled preparation period. The participants were also welcome to conference on their own time whenever convenient. Access to the instructors, colleagues, technical support, and experts in the field occurred entirely over audio or computer conference. Participants had continuous access via conference to the course instructors, their colleagues, mentor teachers, and field experts from around the state of New Mexico.

Collaboration occurred in small groups within the facilities and among colleagues at distant sites via conferencing technology (e.g., educators at the women's prison collaborating with colleagues at the girls' juvenile center). Independently of their instructors, participants conferenced with mentor teachers and field experts, in order to solve problems and complete assignments (e.g., educators at the jail and educators at the psychiatric treatment center conferencing with a field expert on Fetal Alcohol Syndrome). Students had continuous access to a technical support team consisting of two student assistants from the Department of Criminology and the Department of Training and Learning Technologies at UNM, and a high school student with computer expertise from Albuquerque High School. Mentor teachers and field experts had been solicited from the fields of special education, vocational rehabilitation, mental health, criminal justice, correctional education, Indian health, public health, and developmental disabilities.

Before the start of the course, the author/instructor traveled to each of the sites in order to install and test the conferencing equipment, administer a pretest of distance and special education competencies, train the participants on how to use the conferencing equipment, demonstrate how to problem-solve collaboratively, and solicit from the participants a hierarchy of their training needs. Six months before the course delivery, the University of New Mexico hosted a two-day training session for the correctional educators. On the first day the educators met the two instructors face-to-face and learned about the format and content of the course. On the second day they were given e-mail accounts and an introduction to the Internet.

A survey concerning inmates with special needs was administered to the attending correctional educators. It generated the following areas for study: traumatic brain injury, attention deficit disorder, conduct disorder, fetal alcohol syndrome, substance abuse, mental illness, mental retardation, communication disorders, learning problems, and infectious diseases.

All participating sites received a printed text, "Special Education in the Criminal Justice System" and a study guide outlining course assignments. The study guide contained a week-by-week description of the course development. This study guide was purposely designed as a three-ring binder "shell" providing the core of the curriculum while remaining open for expansion, allowing the participants to direct their training as the conferences progress. The guide was written in conversational style and contained the syllabus, participant introductions (including the technical support team and field experts), photos of all participants, readings, assignments, and the audio- or computer-conferencing manual. The author, with the assistance of the technical support team, created audio- and computer-conferencing manuals describing how participants and instructors could use the technology to access the course content and maximize its potential.

Audio Conferences: Synchronous Delivery

Seven sites received the course over audio conference and were equipped with speaker phones, facsimile and answering machines, and call recording devices. All audio conference bridges were supported by the University of New Mexico's conference operators. The course focused on the following disability areas: mental retardation, mental illness/behavior disorders, and learning disabilities. Three weeks were dedicated to each of these areas. At the beginning of the course all participants were asked to fax their colleagues a brief autobiography. On Monday and Thursday of each week, at a designated time throughout the duration of the course, a formal half-hour conference between the instructors and the participants was conducted. The instructors conferenced for half an hour with four sites, disconnected, then established a conference with the remaining three sites. These conferences centered around a set topic but took many different forms (lecture, reactor panel, guest speaker, participant presentation etc.). During the first week, participants discussed the disability topic for approximately ten minutes (discussion based on readings or previous experience), occasionally went off-line for ten minutes to perform an associated activity, then came back on to discuss the activity on-line, generating areas of concern, case histories, and prior problems or strategies associated with that disability area.

Each participant left the conference with an individual assignment (e.g., strategies to try out in the classroom) and an assignment involving team problem-solving across distance, designed to generate better understanding of the disability being studied. Field experts/mentor teachers were assigned or suggested to assist this team problem-solving assignment.

Participants were instructed to try out the classroom strategies with their students and send a short reaction on the success or failure of the suggested classroom strategies via facsimile to their instructors. They also came prepared to discuss the results of the individual assignment on Monday of the second week.

Participants were instructed to collaborate with their teammates (on-site and distance) and field experts initiating their own independent audio conferences. All telecommunications between distant sites setting up the field expert interviews and the actual interviews were taped by the participants for later transcription. Solutions to the problem and information on the disability gleaned during the independent conference calls were edited and distributed by the team and sent via facsimile to all participants. Teams lead the formal half-hour Monday conference call on the third week, sharing with the entire group the information they discovered.

Computer Conferences: Asynchronous Delivery

Eleven sites received the course via computer conference and were equipped with PC's containing word processing, communications, and conferencing software. The conferencing software, Vax Notes, was chosen for its ease of use by computer novices and its ability to allow group problem solving. The on-line class was titled "Prison Conference."

Participants were directed to open the conference, carry out associated activities, and generate areas of concern, case histories, and prior problems or strategies associated with that disability area. There were no time constraints in asynchronous computer conferencing. Participants had continuous access to the conference and left the Weekly Topic with an individual assignment (e.g., strategies to try out in their classrooms) and an assignment involving group problem-solving across distant sites to generate better understanding of the particular disability being studied. Field experts/mentor teachers were assigned or suggested to assist with this assignment. Assignments on the computer conference were identical to those on the audio conference; however, computer participants were instructed to collaborate with their teammates and field experts inside Vax Notes in conferences labeled "Team Assignment" and/or to create and moderate their own conferences. The following are visual examples of the "classroom" inside Vax Notes, illustrating the areas where students "went" to participate in the class and examples of their on-line participation.

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Correctional / Special Education

Created 18-Jan-1994 10:34 | 12 topics | Updated 12-Mar-1994

1.	**Course Description**	Contains course syllabus, rationale
2.	**Introduce Yourself**	Participant and instructor biographies
3.	**The Virtual Cafe**	Socializing, networking
4.	**Course Content Questions**	Assignment direction/clarification
5.	**Technical Problem Solver**	Hardware/software support

6.	**Weekly Topic Discussion**	Lecture and class discussion
7.	**Field Experts**	Communiqué with field experts
8.	**Suggestion Box**	Advice, tips, complaints, discoveries
9.	**TEAM 1.**	Collaborative work and interviews
10.	**TEAM 2.**	Collaborative work and interviews
11.	**TEAM 3.**	Collaborative work and interviews
12.	**TEAM 4.**	Collaborative work and interviews

Topic	Author	Date	Reply	Title
6	UNMB::ROSEH	18-Jan-1994	0	Weekly Topic Discussion
	Egglesto	1-Mar-1994	6.1	First Assignment
	Mdbolson	9-Mar-1994	6.2	Carolyn McDowell #1
	Rrivera	10-Mar-1994	6.4	Short Term Values
	Egglesto	9-Mar-1994	6.3	Test Comments

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Note>6.0
UNMB::ROSEH Weekly Topic Discussion

Welcome to the Weekly Topic Discussion. This is the area that will be most like a classroom setting with weekly lectures, class discussion, content commentary, and continuous access to your instructor, Dr. Eggleston. Dr. Eggleston will introduce the discussion topic each week and work with you through the readings and class assignments. Please check here regularly, read the entries by Dr. Eggleston and your colleagues, and respond when and wherever you feel the need. All contributions are welcome. The more commentary/discussion, the more dynamic and vital this learning experience will be.

Note> 6.1
UNMB::EGGLESTO

My Mother used to say "That which does not kill us makes us strong." I think she was right. By now you should have received a copy of "This is a Test." I would like you to do the test, then respond to the most salient questions (the ones you find most salient) in this section. I am interested in your views. Please feel free to respond to your colleagues entries as they come in. Please remember to identify yourself when you logon, and if you are responding to a particular person, please make that clear. Have a great time.

Note> 6.2
UNMB: MDBOLSON

The questions are really philosophical. Yes, I believe you should teach inmates, career criminals, wards, juveniles, and anyone who is locked up. The reasons we are teaching them is for their benefit and for the society as a secondary reason. The most prevalent impediments to effective instruction is the environment in prison. The teachers lament, "how can I make a difference in 6 hours and then send them back in to the environment that taught what I am trying to change."

Note> 6.6
UNMB:RRIVERA

On Carolyn Mcdowells comment. . .it is unrealistic to believe that in a short time one is going to teach all the skills that should be taught or nurtured by the family. One should attempt to teach short term value oriented assignments. . .like cooperative discipline.

Note> 6.12
UNMB:EGGLESTO

I would like you to respond to question 4, about democratically managed classrooms. By democratic classrooms I don't mean chaotic, undisciplined places, but an opportunity for some choice within the curriculum. Do you think this is even necessary? How about democratic practices within the institution? Before you scream, you should know that there have been democratically managed prisons historically. Even Sing Sing in the 1920's was managed democratically. A current example is going on in Scotland, where the "worst of the worst'" have a special democratically managed unit in a maximum facility. The prisoners even have a final word on hiring of officers and ed staff. A related question would be, if we don't help prisoners learn to act as citizens, how can we expect them to do so once they get out? In 1885 Zebulon Brockway said, "The best behaved inmate often makes the worst inmate."

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Research Methodology
Pre- and post-tests, pre- and post-course questionnaires, group interviews, and a learning-styles inventory were administered to determine the effectiveness of the audio and computer conferences in delivering special education inservice training to the correctional facilities. The pre-course questionnaire was designed to assess participant inservice priorities and preference for delivery over a synchronous or an asynchronous mode. The pre- and post-tests were designed to determine the correctional educators' special education knowledge, attitudes toward inmates with disabilities, opinion of themselves as professionals, association with professional organizations, and perception of whether telecommunications systems can retain an effective human dimension in education delivered at a distance. The transcripts of both the audio and the computer conferences will be analyzed, focusing on the learning process as revealed in the conference messages. Group interviews conducted at each site will be used in order to solicit open, spontaneous, participant-led discussion.

Conclusions
This study hopes to add to the body of knowledge on the pedagogical characteristics of audio and computer conference content, the elements/antecedents which give rise to learning on-line, the

dynamics of teleconferencing in isolated settings such as correctional institutions, and how learning occurs through different media. The technology we choose for distance education and workplace training will serve our educational needs best when we understand how to use the different media to maximum capacity. We need to understand our audience and the abilities of our instructors, and to work together to consider the critical elements of the learning process as we design future training. When instructors and designers understand the nature of adult learning processes in diverse work environments, they will be better prepared to present courses that will transfer information to usable knowledge. Mason (1992) remarked that the processes of defining the aims of conferences and evaluating their content are circular, each one continually illuminating and reinterpreting the other.

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Literacy

Literacy and Technology: Real-Time Learning on the Internet

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Key words: class projects, elementary resources, staff development

Abstract

Successes of a Tempe, Arizona, K-5 school that connected to the Internet in January 1994 will be reported. With the assistance of funding from a school bond, substantial district support, and a

corporate partnership with Motorola, Carminati Elementary staff and students returned to classes in January with direct Internet access in each classroom.

Staff development began in the fall of 1993, as teachers were introduced to the limitless resources which would soon be at their fingertips. One technique to raise the comfort level of each teacher new to telecommunications was a workshop conducted by doctoral students from Arizona State University. Soon local school experts began to emerge, and a support system for hands-on help was developed. Handy tips and practice time were made available, and a weekly newsletter with user friendly resources was published.

Resources were collected and posted in a data base on the local school network. Soon class projects that integrate technology into the curriculum and show both motivational and research value for all students became reality. This is an ongoing, schoolwide project with the goal of using technology to the benefit of all learners.

Space Age Application

On-line Interactive Projects: Connecting Students and Teachers with NASA Scientists and Engineers

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Key words: NASA, mentor, on-line, interactive, science, Internet

Abstract

The ability to place students in contact with scientists and other working professionals is perhaps the most frequently cited benefit of widespread classroom connectivity. The NASA K-12 Internet Project is engaged in pilot projects to test various models for connecting working professionals to students and teachers. The current free-for-all environment may begin to break down as the number of teachers expecting access to experts explodes and as the novelty of writing to students begins to wear off for professionals.

NASA has an active program to experiment with a variety of structures to ensure that the classrooms will continue to have ready access to "real world" motivators/mentors. These projects explore the tradeoffs that affect teachers, students, experts, and project organizers. This talk will present our findings to date.

Project
Courses about Telecommunications for Teachers: Design, Content, and Evaluation Considerations

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Key words: telecommunications courses, Internet training, teacher inservice

Abstract

Project discussants have developed and taught telecommunications courses for preservice, graduate, and inservice teachers. Course syllabi, what we included or dropped, order of presentation, treatment, resources, and other concerns in course design will be discussed, with examples. Participants are urged to bring syllabi of college and inservice courses to share.

Educational technology professionals are developing the knowledge and skills base of teachers who will use telecommunications in education. We are also learning about and adapting telecommunications. In the 1980's we worked our way through computer literacy courses. We invented the applications needed to change computing from counting and record keeping to teaching and learning. This decade is devoted to adapting the resources of electronic networks to teaching and learning. Each new technique, each resource, is hard-won-since we are reinventing telecommunications for learning. The high cost of this knowledge and limited resources of education make sharing techniques an important fact or in progress. Fortunately, one thing that distinguishes educators is the willingness, even eagerness, to share products and experiences and work collaboratively. Vast and invisible networks make the profession's distinguishing trait of collaboration not just desirable but necessary if we are to foster successful implementation.

A few leaders in the field have already done basic work in organizing experiences and helping others along. The Mining the Internet series by Judi Harris, Kathy Rutkowski's on-line NetTeach News, *and guides such as Roberts, Blakeskee, Brown, & Lenk's Integrating Telecommunications into Education or The Internet Companion by LaQuey with Ryer, are creating a body of resources we can draw on to develop our own courses.*

What is necessary for adults, educators, in a course about telecommunications? We know some concerns:

- *There are already more experiences listed and described than can be included in a single course*
- *Each experience has some attractions, but many have hidden drawbacks*
- *Cost, time, and skills of participants are practical constraints*
- *An audience of teachers is different from an audience of K-12 students or technology professionals. This sorting of experiences requires goal setting, audience definition, and formative evaluation. The development process is filled with successes and failures, refinements and invention, that can be shared with others who are teaching similar courses.*

The purpose of this session is to share ideas on what has worked in telecommunications courses for educators and what has not worked. Each panel member will give a brief summary of a course in telecommunications for educators. Syllabi will be provided. Each panel member will summarize the reasons for inclusion and exclusion of experiences and make recommendations on sequence, resources, evaluation, and strategies. The audience will be encouraged to describe their experiences, share syllabi, and discuss the reasons for a particular aspect of course design.

Demonstration

The Mathematics Learning Forums: Distance Learning at Bank Street College of Education

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Key words: telecommunications, professional development, distance learning, mathematics

Abstract

The Mathematics Learning Forums are designed to help teachers introduce new mathematics teaching practices in their classrooms in accordance with current nationwide mathematics reform efforts. Each forum is offered over a telecommunications network, making it possible for teachers to communicate with colleagues throughout the country. The forums are hosted by a faculty advisor and focus on the how of mathematics instruction, providing ongoing support to teachers as they implement mathematics reform in their own classrooms. Each forum focuses on a particular area of instruction such as mathematical content, student learning, teaching strategies, and assessment techniques. The goal of each forum is to help teachers to do mathematics with their students, and to talk about mathematics with colleagues participating in the forum. Through doing and talking about mathematics, teachers can develop a new understanding of the learning process as they pay close attention to the learning of their students, their own learning, and the learning experiences of their on-line colleagues.

The content forums focus on elements of a topic within a content area, rather than providing a broad overview. These forums are designed to introduce selected aspects of an area of study to teachers and to introduce a variety of teaching strategies and approaches to the particular topic. Forums focusing on teaching, student learning, or assessment emphasize teaching strategies and approaches to mathematics that build on teachers' current practices and understandings.

In this demonstration we will walk participants through the structure of the Math Learning Forums, demonstrate the technical environment, and discuss examples of participant conversations.

The Mathematics Learning Forums are funded by the Annenberg/CPB Math and Science Projects.

Panel
Building Reflective and Effective On-line Professional Development Communities

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Key words: telecommunications, reflective practice, professional communities

Abstract

This session will explore the use of networks as a tool for building and sustaining effective professional development communities. Issues of how such learning communities can be designed to support reflective conversation, encourage active ownership among participants, and scale to be both cost-effective and draw in large numbers of teachers will be discussed.

The opportunity has now arrived to use telecommunications technology in the service of large-scale reform of teaching and learning in schools. As a tool for facilitating the professional growth of teachers, telecommunications offers a unique and cost-effective solution to the challenge of providing personalized and effective inservice instruction and support to large numbers of educators. Barriers that are common in face-to-face professional development programs, including the expense of bringing groups of teachers together, scheduling constraints, and the difficulty of sustaining reflection about practice beyond the conclusion of short-term workshops, can be overcome with telecommunications technologies. Network-based communication has shown promise in supporting the development of content expertise and in facilitating reflection about practice; and the asynchronous nature of communication in this medium accommodates teachers' highly scheduled working lives. In this panel session, we will consider a number of issues that are critical to developing and sustaining on-line professional learning communities:

- *What are the different modes for developing and sustaining on-line learning communities?*
- *How can different models of on-line learning communities be scaled so that they become widespread and cost-effective resources for the professional development of teachers?*
- *How is reflective conversation and dialogue best facilitated and sustained in on-line learning communities?*
- *How do you most effectively facilitate ownership of the experiences and activities that make up the on-line learning community among the participants?*
- *How do you most effectively draw in those educators who are not yet involved in telecommunications activities?*
- *How can these models of on-line communities be supported by institutional structures so that they can grow and continue to function, even after initial enthusiasm and initial support disappear?*
- *What sorts of mediator roles are needed for these models to function and how can these mediators be developed and supported?*
- *What kinds of software tools are needed to support the functioning of these on-line communities?*

The members of the panel represent four major efforts to use networks to build educational communities, each of which has taken a different approach to the problem of building effective learning communities. These projects include The Mathematics Learning Forums, LabNet, *Teaching Teleapprenticeships, and AT&T's Learning Circles. The similarities and differences between the various approaches will be used in this discussion as bases for determining general properties that can be used more widely.*

Panel
Wired Cities: Implications for Educational Telecommunications

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Key words: community telecommunications, community networks, wired cities, hardware, networking issues, financial issues

Abstract

The telephone and cable industry has many plans to upgrade the digital communications infrastructure of our communities, "free" communications connections to schools and local government, Internet connectivity to homes and schools. The panelists bring differing perspectives to technical, economic, and social implications of such connectivity for learning, teaching, and schooling.

Questions

- What does cable Internet connectivity or broadband ISDN mean, technically, to a school?
- What are some tradeoffs in selecting local hardware?
- Does commercial availability of broadband digital communications in a community affect the cost and financing of school networking? How?
- What new opportunities for learning may result from community-wide computer-networking infrastructure?
- What should educators be doing to take advantage of changing telecommunications infrastructure in their community?
- What are the hoped-for outcomes of increased citizen access to Municipal Services?
- What policy issues arise out of student, parent, teacher, citizen, and municipal government access to a wide range of information services?

Panelists

Beverly Hunter, Senior Scientist at BBN Educational Technologies, has for many years advanced reform of education through applications of computers and communications. As Program Director for Applications of Advanced Technologies in the National Science Foundation, she initiated programs to apply computer and communications networks to innovation in science and mathematics education.

Beverly is one of the founders of MetroBoston Community-Wide Education and Information Services, a collaboration of over thirty organizations funded by Annenberg/CPB. MB CWEIS has a multi-pronged strategy for technical and information infrastructure across the metropolitan area, with focus on the most underserved groups through education, health, social services, and employment information services. Local construction of knowledge and information services is encouraged through a distributed architecture.

Sandy Guryan is Director of Business and Finance for the Lexington, MA, school, and chairperson of the Lexington Information Network (LINK) committee. The committee represents Lexington's schools, town offices, library, cable advisors, BBN, and MIT Lincoln Laboratory. Lincoln Laboratory is providing a physical connection to the BBN NEARNET Network, Cablevision Systems provides the institutional cable network, and LANcity* equipment is used to allow data to pass over the broadband network.

Guryan's committee is addressing financial, technical, and policy issues that arise from student, parent, teacher, and municipal access to a wide range of information. According to William Spencer, Lexington's Information Network Director, "Lexington, the birthplace of the American Revolution, is becoming the site of yet another revolution in communications within and beyond the community."

Denis Newman initiated BBN's National School Network Testbed and has been working with schools, districts, and state education agencies throughout the country on development of their Local Information Infrastructure. He will discuss architecture of the LII in relation to community telecommunications developments.

Ed Lyell is Project Director at the Education Commission of the States, working with the governor and the legislature on a new agenda for California's schools and colleges. Ed is an elected member of the Colorado State Board of Education. He is Chair of the Telecommunications Advisory Commission to the Colorado Legislature and has been a key force in the establishment of Colorado SuperNet. Since writing his thesis on "computer-assisted instruction in the home" in 1970, he has been an innovative leader and policymaker for education and telecommunications. He will address developments with TCI, Jones Cable, and US West in relation to educational reform.

Rod Bowers is a Manager in External Affairs of Bell Atlantic-New Jersey, Inc. Rod is beginning his twenty-fifth year of work in the telecommunications industry and has experience in engineering, finance and regulatory matters. He will address technical, economic, and regulatory issues in providing increased telecommunications access in communities and schools through the industry's deployment of wideband and broadband services. He will also share specific experiences regarding the Union City Multimedia Education Trial.

Project
Teaching Telecommunications: A Comparison between Video and Computer-Based Instruction

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Key words: video, CBI, simulation, achievement, perception, near-transfer, instruction

Abstract

This paper examines two different delivery methods (video and CBI) for instructing preservice teachers in the use of an electronic mail system. Questions regarding student achievement, perception of instruction, and near-transfer performance are investigated. Results indicate that a significant difference exists between the two delivery methods on students' perception of instruction and on students' near-transfer performance.

Introduction

Telecommunications can benefit education in numerous ways. For example, telecommunications is an excellent means to teach multicultural awareness: "Indeed, never before could teams of students, thousands of miles apart, engage in dialogue through which they jointly construct a model of their respective economics, cultural surrounding, or ecologies, and then collaboratively test its implications" (Salomon, 1991, p. 43).

Communications skills can also be enhanced through telecommunications. Students from different schools, nations, or countries can send their compositions for others to read, critique, and review. Several studies have reported a significant increase in the quality of students' writing with distant audiences (Cohen & Riel, 1989; Wright, 1991).

Telecommunications also inspires students and teachers and makes learning exciting and relevant. Studies have found it to be very motivating for students to correspond through telecommunications with experts who would be inaccessible through other means (Perry, 1984).

The use of telecommunications is flourishing in today's society; hence, telephone companies, on-line commercial services, and state departments of education have taken steps to ensure that the use of telecommunications is an integral part of today's education. For example:

- Tele-Communications, Inc. (TCI) and Bell Atlantic Corporation have joined forces to provide 26,000 K-12 schools, or roughly one-quarter of all U.S. schools, with connections to the information highway (Salvador, 1994a, p. 6).

- Pacific Bell has promised to connect every public school and library in the state of California to the Internet (Graumann, 1994).

- On-line commercial services such as Prodigy and America On-line are offering discounts and special programs to educators (Kinnaman, 1994; Salvador, 1994b).

- Florida, Texas, and other states offer networked education systems that enable their educators to communicate through e-mail, access the Internet, and obtain electronic information and resources at no cost.

Although there is an abundance of educational resources related to the use of telecommunications, few instructional benefits will be realized if educators are not instructed and motivated to use the infamous "information highway." As we have learned by the infusion of computers into the classroom of the 1980s, access to technology will have little effect if teachers are not instructed on how to use and integrate it within the curriculum (Fulton, 1989; Glenn & Carrier, 1989; Munday, Windham, & Stamper, 1991).

Telecommunications, like computers, is now becoming a standard tool for many teachers. In fact, in 1991 the Florida Department of Education implemented an electronic mail system (FIRNMAIL) and provided it free of charge to all educators in Florida. In addition to a technical manual, two alternative training programs (a videotape and a computer-based tutorial/simulation) were developed to provide instruction on using the system. This paper examines the two training methods and their effects on student achievement, perception of instruction, and near-transfer performance.

Research Questions

The study presented in this paper was designed to answer the following questions:

- Is there a significant difference on the mean achievement gains on a written post test between students who are taught FIRNMAIL through a video presentation and students who are taught FIRNMAIL through an interactive, computer-based tutorial/simulation?

- Is there a significant difference on students' perception of instruction between students who are taught FIRNMAIL through a video presentation and students who are taught FIRNMAIL through an interactive, computer-based tutorial/simulation?

- Is there a significant difference on the mean near-transfer performance between students who are taught FIRNMAIL through a video presentation and students who are taught FIRNMAIL through an interactive, computer-based tutorial/simulation?

Review of the Literature

Research suggests that video and computer-based technologies can provide effective instruction for adult learners (Dillion & Kincade, 1990; Lewis, 1976; Moore, 1987; Sivin-Kachala & Bialo, 1993). Hannafin (1985) notes, however, that "little evidence supporting the *differential* effectiveness of instructional technologies exists" (p. 235). For example, in their analysis of 63 interactive video-related studies, McNeil and Nelson (1991) report that there were no significant differences in achievement between students using only videodiscs and students using interactive videotape-based units. In other comparison studies, researchers report that video can be just as effective or more effective than other forms of instruction (Atherton & Buriak, 1988).

Research on simulations is also controversial. Thomas and Hooper (1991) reviewed and categorized 29 simulation studies, most of which indicated no difference in knowledge gained when compared to other methods of instruction. They did find, however, that simulation groups presented a higher degree of transfer, citing Mayer (1981) that "the value of . . . simulations appears to be greatest where the material to be learned is foreign to the learner and the goal of the instruction is transfer" (p. 500).

Other studies are contradictory. Kinzer, Sherwood, and Loofbourrow (1989) conducted a study in which one group of fifth graders acquired knowledge about a food chain by reading an expository text while another group of fifth graders used simulation software. The non-computer group outperformed the computer group on all measures. Woodward, Carnine, and

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Gersten (1988), however, reported significant differences ($p<.01$) on basic facts and concepts that were reinforced by a simulation treatment versus those presented by structured teaching alone. Much of the controversy and mixed results of simulation studies can be attributed to fundamental weaknesses in research design, the multiple definitions and subcategories of simulations, and the unknown quality of the simulations used (Thomas & Hooper, 1991; Woodward, Carnine, & Gersten, 1988).

Although there appears to be a significant amount of research on the effectiveness of computer-based instruction (CBI) and video, little research has examined students' perception of such instruction. Winn (1993) notes that "[p]erception can be thought of as a set of physiological and psychological processes by means of which we make sense of our environment" (p. 57). Perception of instruction can influence student motivation toward instruction, as well as the students' ability to process information (Milheim & Martin, 1991; Newby, 1989; Winn, 1993).

Researchers have been examining teachers' perceptions about computers for over a decade (Bracey, 1990; Dupagne & Krendl, 1992; Handler, 1993; Knupfer, 1990; Knupfer, 1989-90; Mackowiak, 1991). In a review of the literature on teachers' attitudes toward computers, Dupagne and Krendl (1992) found that "[t]he literature stresses the importance of training to stimulate teachers' computer use and to foster favorable attitudes toward computers" (p. 423). They also state "The less anxious teachers are about computers, the more likely they are to implement computers in the curriculum" (p. 423). Teachers' perception of the delivery method of instruction, therefore, can play a significant role in their attitudes and use of technology.

Methods and Data Source

This study was conducted at the University of South Florida, Tampa, Florida, during the fall semester of 1993. The population consisted of undergraduate, preservice teachers enrolled in EME 4402, Microcomputers in Education, in the College of Education. The sample was constructed using 24 volunteer students. The students were randomly assigned to one of two conditions: video or CBI. None of the students had any prior experience with FIRNMAIL or telecommunications.

The video was designed by the Florida Information Resource Network, and it demonstrated the procedures for logging in to FIRNMAIL, reading a new message, creating and sending a message, and logging out of FIRNMAIL. The same material was presented through an interactive, computer-based tutorial/simulation. Students viewed the video in groups of three and four, were encouraged to ask questions, and were allowed to review any information on the videotape. Students assigned to the computer-based tutorial/simulation worked individually. Students in each group took approximately 40 minutes to complete the instruction.

Both the tutorial/simulation and the video were critiqued and validated by experienced FIRNMAIL users and FIRNMAIL support personnel (FIRNTECs), following the guidelines set by Ruben and Lederman (1982), who note: "The criterion of construct validity is satisfied when the rules, roles, interactions, goals, and the criteria of the game or simulation have one-to-one counterparts in the skills, concepts, and paradigm, or theoretical framework, that the activity is intended to impart" (p. 238).

All of the students followed the same sequence of instruction. Each group received a pretest, followed by instruction (video or computer-based), a posttest, a FIRNMAIL assignment, and a perception questionnaire on the instruction.

Both the pretest and the posttest were in multiple-choice formats, administered via paper and pencil, and consisted of 25 knowledge-level questions relative to the instruction. The posttest paralleled the questions on the pretest, and neither test had a time limit. Cronbach's alpha coefficient of internal consistency reliability was reported at .91 for the pretest and .88 for the posttest.

The FIRNMAIL assignment required students to read a new message, create and send a message, and log out. Students were labeled "successful" if they were able to read a new message, create and send a message, and log off the system.

The perception questionnaire was constructed in a binary (agree/disagree) format and consisted of nine questions and two fill-in-the-blank options for student comments. The questionnaire specified the video or tutorial as the instructional component. The students were asked to respond to the following agree/disagree questions:

- I felt I could work at my own pace.
- I enjoyed using the video/tutorial.*
- I would have rather had a lecture in a classroom.
- There was too much information to remember.
- I would like to take another lesson like this.
- The lesson gave clear explanations of the material.
- The video/tutorial was boring.*
- I would rather read the material in a book.
- I like to learn new things through video/computers.*

*The question was worded to correspond the student's mode of instruction.

The analyses incorporated analysis of covariance for pre- and posttest scores, t-tests to measure any significant differences between group transfer performance, and chi-square analyses to examine the students' perception toward instruction. Cramer's V was used as the chi-square measure of association. The level of significance for the analyses was set at .05.

Data Analysis

Achievement

Results of the pretest and posttest indicated that both treatments were instructionally effective. Achievement for both groups increased significantly between the pretest and the posttest (see Table 1).

Table 1. T-Test for Pretest and Posttest Scores

Group	Test	Mean	SD	DF	T	Sig. p
Video (n=12)	pretest	9.00	1.86	11	8.24	<.01
	posttest	17.25	2.14			
CBI (n=12)	pretest	9.75	3.02	11	29.68	<.01
	posttest	17.83	2.03			

In order to ascertain that the treatment groups were equal at the beginning of the experiment, a t-test was performed on the pretest means. The results of the t-test on the pretest means indicated that the two groups differed significantly at the beginning of the experiment; therefore, an analysis of covariance was used (using the pretest as the covariant) to examine the results of the posttest. These results are presented in Table 2. No significant findings were revealed between the achievement gains of the two groups.

Table 2. Results of Analysis of Covariance on Posttest

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig. F
Covariate Pre	10.26	1	10.26	2.48	.13
Main Effects Group	.89	1	.89	.22	.68
Explained	11.16	2	5.58	1.35	.28
Residual	86.80	21	4.13		
Total	97.96	23	4.30		

Perception of Instruction

Significant differences were found between the groups toward their perception of instruction. Chi-square analyses indicated that students in the computer-based tutorial/simulation group were more likely to:

- enjoy the instruction
- prefer their mode of instruction over a lecture
- want another lesson like this
- prefer their mode of instruction over reading the material in a book.

These results are presented in Figures 1, 2, 3, and 4.

Figure 1. Chi-square Analysis for "I enjoyed using the video/tutorial."

	CBI	Video	Row Total
Agree			
Count	12.0	6.0	18.0
Exp. Value	9.0	9.0	75.0%
Residual	3.0	-3.0	
Disagree			
Count	0.0	6.0	6.0
Exp. Value	3.0	3.0	25.0%
Residual	-3.0	3.0	
Column Total	12.0 50.0%	12.0 50.0%	24.0 100.0%

Pearson chi-square statistic = 8.00
Cramer's V = .58
$p<.01$

Figure 2. Chi-square Analysis for "I would have rather had a lecture in a classroom."

	CBI	Video	Row Total
Agree			
Count	0.0	6.0	6.0
Exp. Value	3.0	3.0	25.0%
Residual	-3.0	3.0	
Disagree			
Count	12.0	6.0	18.0
Exp. Value	9.0	9.0	75.0%
Residual	3.0	-3.0	
Column Total	12.0 50.0%	12.0 50.0%	24.0 100.0%

Pearson chi-square statistic = 8.00
Cramer's V = .58
$p<.01$

Figure 3. Chi-square Analysis for "I would like to take another lesson like this."

	CBI	Video	Row Total
Agree			
Count	12.0	7.0	19.0
Exp. Value	9.5	9.5	79.2%
Residual	2.5	-2.5	
Disagree			
Count	0.0	5.0	5.0
Exp. Value	2.5	2.5	20.8%
Residual	-2.5	2.5	
Column Total	12.0 50.0%	12.0 50.0%	24.0 100.0%

Pearson chi-square statistic = 6.31
Cramer's V = .51
$p<.02$

Figure 4. Chi-square Analysis for "I would rather read the material in a book."

	CBI	Video	Row Total
Agree			
Count	0.0	5.0	5.0
Exp. Value	2.5	2.5	20.8%
Residual	-2.5	2.5	
Disagree			
Count	12.0	7.0	19.0
Exp. Value	9.5	9.5	79.2%
Residual	2.5	-2.5	
Column Total	12.0 50.0%	12.0 50.0%	24.0 100.0%

Pearson chi-square statistic = 6.31
Cramer's V = .51
$p<.02$

Near-Transfer Performance

A t-test analysis revealed that students in the CBI group performed significantly better on the FIRNMAIL assignment than the students in the video group did. These results are presented in Table 3.

Table 3. T-Test Comparing Group Near-Transfer Performance

Group	Mean Score of Success	SD	DF	T	Sig. p
Video (n=11*)	.46	.52	20	3.45	<.01
CBI (n=10**)	.80	.42			

* One student was unable to participate because FIRNMAIL was down.

** Two students were not able to participate because FIRNMAIL was down.

Discussion

Achievement

The results of this study did not find a significant difference on the mean achievement gains on a written posttest between students who were taught FIRNMAIL through a video presentation and students who were taught FIRNMAIL through an interactive, computer-based tutorial/simulation. These results support previous research stating that video and computer-based instruction can provide effective instruction for adult learners. T-tests revealed that both groups made significant achievement gains ($p<.05$) in their knowledge of FIRNMAIL.

Perception of Instruction

There was a significant difference on students' perception of instruction between students who were taught FIRNMAIL through a video presentation and students who were taught FIRNMAIL through an interactive, computer-based tutorial/simulation. Results indicate that students prefer to learn about the use of telecommunications through an interactive, computer-based tutorial/simulation rather than through a video. Students made the following comments about what they liked and disliked about their mode of instruction:

Students using CBI: (Liked)

- I liked the interactive nature—it really involved me.
- The instructions were very detailed on how to use FIRNMAIL. It allowed one to go back and review.
- I enjoyed being able to go at my own pace. I also liked that you could go back to a particular area at any given time. I also liked practice at the end of each section.

- All instructions were very clear and instruction was easy to follow.
- I liked getting feedback and if I chose the incorrect answer I had to find the correct one on the next try.
- It had step-by-step directions.

Students using CBI: (Disliked)

- There was nothing I disliked.
- A little more practice may have helped.
- A few screens could have been combined.

Students watching video: (Liked)

- It was very detailed; the explanations were thorough.
- It was informative with clear details.
- The examples were done while the speaker was explaining the concept or instruction.
- The people who did the video were knowledgeable, polite, and tried to be very helpful.
- The video gave a step-by-step procedure for working through the program.
- The fact that after the video we discussed any questions that were bothering us.

Students watching video: (Disliked)

- I didn't have a chance to practice it on the computer while it was being explained.
- It was hard to see the screens and menus in the video.
- The information was given too fast.

Overall, seven of the 12 students (58%) in the CBI group found nothing they disliked about their instruction. On the other hand, all of the students in the video group reported disliking their instruction in some manner or form. For example, three of the 12 students commented on wanting hands-on practice, while six of the students commented that the computer screens and menus were difficult to read via video.

Preference for CBI has implications for the teaching of telecommunications to future educators. Student comments suggest that they prefer hands-on instruction; the opportunity to review, concise step-by-step instructions, immediate feedback, practice exercises, and to work at their own pace. Based on the comments made by the students in the video group, fidelity of instruction is a key factor, especially when it comes to seeing the computer screen and practicing the procedures. In addition, student comments and perception of instruction support the idea that computer-based instruction can allow users to interact and simulate the use of a telecommunications system, whereas video remains a passive instructional tool.

Near-Transfer Performance

There was a significant difference on the mean near-transfer performance between students who were taught FIRNMAIL through a video presentation and students who were taught FIRNMAIL through an interactive, computer-based tutorial/simulation.

The students' ability to complete the FIRNMAIL task successfully differed significantly between groups. Eighty percent of the students in the CBI group were successful in reading a new message, creating and sending a message, and logging off of FIRNMAIL, whereas only 45 percent in the video group were successful.

Results of this study support research by Alessi (1988), who noted that computer-based simulations were superior to other media (print, film, video, or lectures) for teaching transfer, and researched by Reigeluth and Schwartz (1989) and Gorrell (1992), who stated that simulations enhance transfer.

Conclusion

This study emphasizes the importance of the method of instruction and its effect on students. One point is clear: If we are to engage educators in the use of telecommunications, it is important that we first engage them in the instruction about telecommunications. Based on the results of this study, it appears that hands-on instruction via CBI is a key factor in transfer and student perception of instruction. In addition, paper and pencil achievement tests do not necessarily measure a student's true ability in procedural knowledge.

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Math/Science
PBS MATHLINE: Middle School Math Project

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Key words: professional development, middle school mathematics teachers

Abstract

PBS MATHLINE is a new education service of public television using the power of telecommunications to provide quality resources and services for those pursuing excellence in mathematics. The primary purpose of PBS MATHLINE is to support the nation in pursuit of its goal to be first in the world in mathematics achievement by the year 2000. PBS MATHLINE services are developed in partnership with the National Council of Teachers of Mathematics (NCTM) to assure alignment with the challenging standards set by the mathematics education community. The decentralized infrastructure of public television is ideally suited to the reform strategy of this mathematics education community: national standards—local implementation. PBS will offer a core service for mathematics education to which local stations may add services uniquely suited to the clientele which they serve. In this way, public television stations will be an active partner in ensuring PBS MATHLINE's success at the local level.

The Middle School Math Project, the first project of MATHLINE, provides video modeling and on-line mentoring opportunities for classroom teachers at the middle grades level, 5 through 8. Participating teachers will engage in a year-long professional development program that focuses on the NCTM ***Professional Standards for Teaching Mathematics*** *while incorporating the mathematical content delineated in the NCTM* ***Curriculum and Evaluation Standards for School Mathematics.*** *Participants will be given 25 videos featuring accomplished teachers modeling effective teaching methods. By viewing these videos, teacher participants will have the opportunity to observe teachers from across the country implementing standards-based teaching practices in their classrooms. The videos are accompanied by related materials that include comprehensive lesson plans and reflective questions based on the recommendations in the standards. The video lessons set the stage for the on-line mentoring component. This on-line environment, coordinated by a teacher/facilitator, provides teachers with opportunities to interact with peers while benefiting from group discussions, problem-solving challenges, and other activities. Each local learning community will average 25 teacher participants, a good sized group to allow for in-depth explorations of issues surrounding mathematics reform. During the academic year, teachers will have the opportunity to participate in two interactive national videoconferences. These conferences will unite teacher participants with each other, with other on-line facilitators, with the video teachers, and with the project director. They are designed to provide national focus to local implementation.*

During the 1994-95 academic year, 20 licensees will be offering the Middle School Math Project in 16 states. An additional 51 licensees in 20 states will be offering the project during the 1995-96 academic year. It is expected that in two years over 2,200 middle school mathematics teachers will be able to benefit from the Middle School Math Project.

The Middle School Math Project is partially funded by grants from AT&T, The Carnegie Corporation of New York, and the Corporation for Public Broadcasting.

Project

Creating a Learning Community: Professional Development for Non-Traditional Learners

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Key words: distance learning, early childhood education, evaluation, Head Start, professional development, rural education, technology

Abstract

The Early Childhood Professional Development Network, located at South Carolina Educational Television, has established a collaboration of the early childhood professional community, post-secondary institutions, and public broadcasting. Its purpose is to provide instruction to learners in rural and isolated areas of the United States and its territories. In the demonstration project funded by the U.S. Department of Health and Human Services, ECPDN has delivered a 120-hour training package to approximately 1,200 Head Start participants via satellite. The instruction is based on child development and early childhood education principles, Head Start Program Performance Standards, and the requirements for the Child Development Associate (CDA) credential.

The ECPDN demonstration relies on a variety of technologies—including video teleconferencing, audio bridge, and fax—to bring quality training to its widely dispersed audience. These technologies are applied to two primary training activities—forty live, interactive video seminars and weekly telephone discussion groups that link participants with veteran early childhood educators and with each other.

In its first two years of program implementation, the ECPDN project provided training to Regional, Native American, and Migrant Head Start grantee programs in 38 States and the Virgin Islands, Puerto Rico, and islands in the Pacific. Second-language simultaneous translation is provided for participants in Puerto Rico. Various locations are employed as viewing sites for the seminars, including post-secondary institutions, public schools, libraries, hospitals, utility companies, and even a police station. A facilitator—usually an experienced member of the grantee staff—is present to guide and assist participants during the seminars.

A unique aspect of the ECPDN training is that participants attend the weekly seminars as members of a classroom team—with the ideal team consisting of a teacher, a teacher's aide, and a parent. Partly as a result of this team training concept, the educational and experience levels of the training participants are quite varied. Despite the wide variation among participants in terms of ethnicity, education and training, experience, and reason for participation, the majority of participants shared similar learning styles. A learning styles assessment was administered to all participants, and nearly 80 percent of the participants were found to prefer concrete, experiential learning to more abstract approaches. The ECPDN program, which is highly visual and oriented to specific classroom applications, is well suited to these nontraditional learners.

Based upon four semesters of evaluation data collected by Macro International, it appears that the ECPDN demonstration has been successful in reaching the majority of its participants. Site visits in spring 1994, at the conclusion of the training for the second cohort, assessed changes in classroom methods and behavior through the use of observational instruments in a pre/post design.

Remote/Distance Education

The Deaf Education Network: A Community of Learners

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Key words: deafness, Internet, Gopher, model, multimedia, training

Abstract

The problem of deafness is not a lack of hearing, but an abundance of isolation. This isolation is a result of the difficulties that the deaf experience in speaking and those that the hearing experience in signing. The isolation is also attributable to the tremendous amount of day-to-day information that is spoken, rather than written or signed. As a result, one of the primary goals of teachers of the deaf is to reduce the interpersonal and informational isolation that is so often experienced by their students. Surprisingly, this same isolation is experienced by the teachers themselves.

Historically teachers of the deaf were concentrated in large residential schools or magnet day class programs. This is no longer the case. Educational reform, parental preference, and diminishing school budgets have shifted the education of deaf students to small, community-based programs. Within these programs there are few deaf students and even fewer professionals who have any knowledge of, or interest in, deafness. To compound the problem further, teachers of the deaf are increasingly expected to work with their students within the context of the general education classroom. This context requires that the teacher serve as a "consultant" and co-teacher with her general education peer, while also working with both hearing and deaf students. Unfortunately, neither the deaf education nor the general education teachers were prepared for this collaborative role.

Teacher inservice days, state conferences, professional publications, and curriculum consultants are unable to provide the day-to-day information and interactional contacts needed by special education and general education teachers. Fortunately, an additional resource is becoming increasingly available, i.e., state-based telecommunications networks. These networks, while in varying stages of development, have the potential to increase substantially the interactional, informational, and learning opportunities that are available to teachers and their students. However, before this potential can be achieved, four things must occur. First, telecommunication network access must be made available in each classroom. Second, teachers and their students must be trained to use the telecommunications hardware and software. Third, once connected, teachers and students must have individuals to communicate with, information to read/download, and learning opportunities in which to participate. Fourth, the impact of all this time, effort, and expense must be determined and used to guide further technological innovations. If successful, telecommunications technology will enable communities of learners to be established throughout the world. Schools will focus on accessing, rather than duplicating, the world within their libraries and media centers. Teachers will concentrate upon mentoring their students through the learning process, rather than controlling their inappropriate behavior. And students will look forward to their school work rather than dreading and trying to get out of it. This model, while distant, is emerging in the field of deaf education. The purpose of this presentation is both to describe and to demonstrate the model as it is currently available on the Internet.

Sixty-four U.S. colleges and universities prepare individuals to be teachers of the deaf. Each of those preparation programs is composed of experts in the field of deafness. Each program requires its students to spend two to five years in intensive study and 500 to 700 hours of field experience with existing teachers of the deaf. The majority of these programs have agreed to collaborate in the design, development, use, and evaluation of an Internet-based professional development network. The Kent State University College of Education Deaf Education Teacher Preparation Program has the network leadership responsibility. That responsibility includes the development of multimedia Internet training material, identification of Internet access points,

establishment of an Internet Gopher and Mosaic site, securing funding support, and carrying out initial evaluation efforts. Examples of the resulting material, sites, and information will be shared at the presentation. Demonstration of the Deaf Education Internet Gopher will also be provided. Additionally, the applicability of the development model will be discussed in relation to other areas of education.

Modern Language/ESL

International E-mail Projects in ESL Curriculum: What Works, What Doesn't

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Key words: e-mail, international, ESL, curriculum, writing

Abstract

Two international e-mail projects involving about 250 students from 11 universities in fall 1993 and spring 1994 will be described, compared, and evaluated as part of an English writing course. Students' feedback and writing will be analyzed and teachers' experience collated to see what works and what doesn't.

The Hong Kong Connection

With the rapid expansion of telecommunications in the classrooms around the world, more teachers than ever are trying to capitalize on the potential of international networks to teach writing and to help students use English as a language of wider communication. This is a report on two pilot projects involving the use of e-mail in an ESL curriculum team-taught by two writing instructors in Hong Kong.

We shall describe and evaluate two e-mail projects. The first, Penpal93, was a pen-pal project conducted in autumn 1993. Four universities were involved: Chinese University of Hong Kong (CUHK), Temple University in Japan, University of British Columbia in Canada, and City University at New York.

The second is an ongoing e-mail writing project. EM94. which was started in spring 1994 and involved nine teachers from eight universities: CUHK, Helsinki University of Technology, and six American universities. A third project is being planned for fall 1994.

Comparison of Penpal93 and EM94

Both projects, Penpal93 and EM94, are part of an English course at CUHK—Thinking through Writing. The overall objective is to help first-year college students to get the most out of their university education from a language perspective. Students learn to write academic essays and research papers.

Penpal93 paired up 10 Hong Kong students with 30 students from three other universities. There was no specific task—except a 500-word essay with an appendix of samples of e-mail conversation. The theme was "College Life—A Comparison between Japan, Canada and Hong Kong." The project gave Hong Kong students a chance to communicate with students abroad and aroused their interest in cultural understanding. However, there were problems. We shall discuss the methods used and the problems encountered.

EM94 involved 250 students (39 from Hong Kong) of 30 different nationalities. Unlike the first project, the EM94 curriculum included formal writing tasks and e-mail discussion groups for students and teachers. The project was bigger and more structured than Penpal93. There were 39 topics and discussion groups. Students were required to submit an article on their experience of the project and a research paper. We have been analyzing students' writings and teachers' feedback. The results are collated as a fact-finding exercise on what opens windows for ESL learners and what doesn't.

Summary of Preliminary Findings

WHAT WORKS	WHAT DOESN'T
1. A good mailing list system	1. No definite mailing list
2. Adequate access to resources	2. Inadequate computer access
3. Adequate time to learn and use the system	3. Radically different term dates affect the e-mail writing process
4. Good matches of classes in terms	4. Mismatch of goals and of objectives and levels
5. Advance planning	5. Failure to plan properly
6. Formal writing tasks with a given list of topics	6. Informal writing tasks, too many topics, too big lists
7. Teachers' forum and collaboration	7. Little or no collaboration
8. Adequate e-mail instruction	8. Inadequate instruction on e-mail skills
9. Integration of e-mail into the ESL	9. E-mail excluded from the ESL curriculum

10. Willingness to embrace new technology and to grow	10. Fear of new technology
11. Students' "ownership" of the project	11. No personal responsibility as writers, respondents, researchers, negotiators, and judges
12. Writing for a real audience	12. Inadequate response
13. Real competition and cooperation	13. Too many assignments
14. Optimum group size: 6-10	14. Group size too big/small
15. Excitement about e-mail as a medium they will use increasingly in college and in the workplace	15. No real purpose; no need to use e-mail to communicate

Lines of Further Research

- How does the use of e-mail influence the methodology, classroom management, roles and learning styles in the writing classroom?
- What are the implications for ESL curriculum and on-line education?
- How effective are these international e-mail projects in teaching writing? How do we evaluate such kinds of virtual classrooms?

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Teacher Education

Opening the World to Preservice Education Majors using Telecommunications

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Key words: collaboration, telecommunications, preservice education, curriculum integration, student-centered, thematic instruction

Abstract

Southwest Texas State University students who are preparing to become certified teachers can enter a field-based, preservice educational program at the Center for Professional Development and Technology that allows the preservice students to work with teachers, students, and professors in an elementary classroom on a regular basis. This program requires collaboration among mentor teachers, university professors, and the preservice education students.

At Bowie Elementary, where the center is based, the preservice students learn the importance of integrating technology and telecommunications into the elementary curriculum. The teachers show the university students many of the important resources available on the Internet, such as Gopher, Telnet sites, and FTP addresses. In addition, the students learn to participate in

collaborative telecommunication projects that include other university students and elementary students.

This session will give educators information on how to involve teachers and students at all levels in telecommunications. Hints on various telecommunications projects will be discussed. We will demonstrate our approach to introducing preservice students to telecommunications networking and the electronic "superhighway" of information.

Project
TENET Mini-Grants: Curricular Infusion Projects

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Key words: telecommunications, curricular infusion, projects

Abstract

TENET, the Texas Education Network, funded 32 mini-grant proposals for curricular infusion projects using telecommunications via TENET. These projects cover many curriculum areas and grade levels, and provide various types of collaborative activities. This presentation will discuss the mini-grant process, highlight some of these projects, discuss implementation strategies and the role of the presenter as on-line facilitator, and provide information for those interested in participating in any of the projects.

The mini-grant projects include such topics as Math Mysteries, Green Dream Machine (art and ecology in action), Keypal Exchanges, Classroom Exchanges, Genome Exploration, Global Reef Systems, Biology/Marine Sciences, Virtual Visits, Electronic Mentoring, Agriculture, Crockett Project: Looking Back to See the Future, Architecture Is Elementary, Texas HS News Bureau, Special Education Hypercard Project, Spanish Culture and Language Studies, School Team Mediation.

Middle School Project
How the Tenet of a Student Changed with TENET

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Key words: telecommunication, TENET, at-risk, interdisciplinary

Abstract

The participation in telecommunications projects has enabled students to create a vision greater than their environment and provided opportunities for middle schoolers to grow experientially and educationally.

Yes, I Can!

YES, I CAN! is the motto of Northbrook Middle School, and TENET has been a catalyst for changing the tenets of these middle school students. The opportunity to virtually leave the community and explore the world by going to dog races to Alaska, participating in virtual field trips, and talking with peers all over the world has made a positive difference in many students' lives.

One of the tools used to broaden the horizons of the middle school students was a survey, the Global Handshake, created by the author and advertised on the Internet. Hundreds of responses were received from many different countries and from many states in the United States. Students were amazed to find out how much people are both alike and different in their personal preferences.

The students have been telecommunicating via dial-up modems for the past two years. During the 1993-94 school year, a direct connect to the Internet via a T1 line was established, making a significant difference in the way telecommunications is used in the classroom. Different opportunities are now available through the use of a broad base of Internet tools.

Demonstration
Creating a Campus-wide Information System with MacHTTP and Gopher

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Key words: MacHTTP, Gopher, CWIS, Internet, Macintosh

Abstract

Technical, organizational, legal, and human factors must be considered early on in the design of a campus-wide information system (CWIS). Technical issues include the choice of hardware and software, working with campus network personnel, and gaining access to on-line sources of help. Organizational considerations such as the use of existing campus naming conventions, standardization of directory structure, and non duplication of information sources through information providers and owners ease initial development and facilitate smooth growth of the system. Human factors go beyond the design of the interface and include buy-in of both information providers and information consumers, and are critical for success. Finally, what to publish to the world at large and what to make available only on campus, as well as what not to publish at all, are topics that should involve the legal department and upper levels of the administration.

Internet Project
Teaching and Learning in the Telecommunications Age: The Educational Internet

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Key words: Internet, K-12, education, curriculum, telecommunications, teaching, learning, project

Abstract

For the past three years, the Mass LearnNet has offered Massachusetts educators full access to the Internet. In those three years, the presenters have observed an explosive use of the Internet by our K-12 educational community.

We will profile schools and individuals who are pioneering innovative uses of this valuable and enormous resource and discuss how to build a successful on-line project.

In addition, we will discuss how the Massachusetts Corporation for Educational Telecommunications (MCET) and Merrimack Education Center (MEC) have collaborated to integrate the Internet and the classroom by successfully pooling resources to benefit our respective communities.

Introduction/The LearnNet

In 1990, the Merrimack Education Center (a nonprofit, nationally connected research and development institute) and the Massachusetts Corporation for Educational Telecommunications (an interactive satellite distance learning provider for the K-12 community) joined forces to offer MassachusettsU educators a computer network, the Mass LearnNet. LearnNet users were able to find out about, register for, and evaluate MCET's distance education programs on-line. About a year later, MEC was able to offer LearnNet users full access to the Internet, thanks to a successful pilot project with the Massachusetts Education Computing Network (MECN). Original offerings included Archie, Gopher, outgoing Telnet and FTP; IRC, WAIS, and menu-driven access to libraries, universities, and organizations.

The introduction of the Internet has encouraged nearly 4,000 teachers and administrators to apply for accounts on the LearnNet. In addition, MEC has opened its EduNet computer network to over 1,000 other users on networks such as REMS (Regional Electronic Magnet School Re: Math & Science), ISNET (Independent School Network), CLACC (Collaborative Libraries Catalog Consortium), and NH SERESC. To respond to educators interest in the Internet, MEC has developed a popular and extensive selection of Internet workshops, and MCET offers Internet teacher training via its satellite network, monthly LearnNet workshops, and presentations.

Realizing the Internet's Potential for Education

We will present examples of successful teachers and schools who are enhancing their teaching and learning by using the Internet to:

- Learn how to use technology and telecommunications
- Empower students and teachers to "learn how to learn"
- Communicate with experts
- Access specialized outside resources
- Learn about other cultures
- Find native language resources
- Collaborate with colleagues
- Develop professionally
- Publish electronically
- Share resources and lesson plans
- Communicate within a school district
- Enable technology reform

We will discuss how to build a successful on-line project, based upon our and our teacher's experiences.

Collaborations
We will discuss how organizations can successfully pool resources to benefit their respective communities and expand their reach. MCET and MEC have collaborated to integrate the Internet and today's classroom.

Looking Ahead
MCET and MEC, along with other educational organizations within the Commonwealth, are involved in the development of RMass Ed On-lineS, Massachusetts' new educational technology reform legislation. This new initiative's goal is to create a statewide computer network that will have relevant curriculum connections for users.

Paper
The Role of the Moderator for On-line Telecommunication Projects

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Abstract
This paper reports the results of data collected electronically using a survey for moderators of on-line telecommunications projects. Data were analyzed by network type, defined for this study by functionality and capabilities. Information from five types of networks provide an insight into the diverse duties, responsibilities, compensation, and time that moderators spend on-line.

Is the role of a moderator crucial for the success of an on-line telecommunications project? A survey, conducted using electronic networks, provided data on the diverse duties of moderators and the extent to which they contribute to the development and documentation of the projects.

Networks were divided into five categories based on differing capabilities and functionalities:

1. *Bulletin board or distributed network, such as FrEdMail, Fidonet, Breadnet*

2. *State or regional network*
3. *Internet, Bitnet list, or Usenet newsgroup*
4. *Commercial network, such as Prodigy, Genie, CompuServe, and America On-line*
5. *Commercial educational, such as National Geographic Kids Network, AT&T Learning Network*

The survey analyzed how moderators are chosen, their responsibilities for training, how they encourage participants, what technical expertise is provided, how supporting materials are developed, and how the effectiveness of their work is evaluated.

The results suggest that a diverse set of reasons drive moderators to spend from 7 to more than 10 hours a week on-line managing their projects. Some moderators spend an average of 18 hours a week working on their projects, but delineating the time between personal use and project use is difficult. One participant noted that planning time off-line should be considered, just as teachers and consultants include planning time in their work week.

While bulletin board and state network users lead the list for number of hours on-line per week, as well as number of hours performing moderator duties, commercial networks provide the most encouragement for project members and have a more direct impact on the development of the curriculum for on-line activities. Moderators are not usually compensated for their work and they spend extensive time on-line with little formal evaluation and/or feedback.

In addition, a glimpse into the future tools and utilities for moderator use will be examined. How these new Internet tools and graphical user interfaces will assist the moderators may determine whether or not the networks will survive the duties and overload heaped upon moderators.

Demonstration
Infusing Kidlink Telecommunications Activities into a Middle School Curriculum

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Abstract

Kidlink@vm1.nodak.edu is an Internet listserv begun in 1990 specifically for students ages 10-to-15. A corresponding list, Kidcafe, provided a meeting place for kids only. Today there is a host of lists for adults and students, including two lists for telecommunications projects. This presentation brings together seasoned teachers and a professor of education to share their methods for incorporating these lists and activities into the middle school curriculum.

Kidlink is one of several listserv lists begun by a writer in Norway and housed on computers in South Dakota. It is designed for students ages 10 to 15, which include fifth to ninth graders in the United States educational system. All students begin their association with Kidlink@vm1.nodak.edu lists by answering four questions:

1. *Who am I?*
2. *What do I want to be when I grow up?*
3. *How do I want the world to be better when I grow up?*
4. *What can I do now to make this happen?*

Students can write electronic pen pals using the Kidcafe@vm1.nodak.edu list, where the metaphor of a "cafe" describes how students meet, greet, and learn about each other. The Kidforum@vm1.nodak.edu and Kidproj@vm1.nodak.edu lists are used for classes who agree to participate in one of the myriad of telecommunications activities.

Projects are often interdisciplinary, always attract classes from a variety of countries, and engage students on several cognitive levels.

Virginia
At Northcross School in Roanoke, sixth-grade students sent their responses to the Kidlink questions to response@vm1.nodak.edu. Once students had introduced themselves, they were ready to plan a three-day tour of their hometown for other participants in the **Virtual Vacation**, a project run on kidforum@vm1.nodak.edu. The middle school wall outside the computer lab displayed samples of travel logs from students throughout the states and from 16 countries, including Russia, Slovenia, Uruguay, England, Finland, Denmark, and Iceland.

We learned that Portoroz is a tourist city by the sea in Slovenia. Students in Finland suggested barbecued sausages for lunch while students from Iceland recommended singed head of lamb. Our students wrote their vacation plans for our city in groups of four, using an electronic Atlas and MacGlobe to research local points of interest. These itineraries then prompted a new round of exchanges as students asked each other about special features of their hometowns.

Florida
Students at Myakka River Elementary in Port Charlotte wrote to others in Norway throughout the Winter Olympics. Another writing project found students comparing journals of daily events in ***A Day in the Life Of***. Students wrote an entry in their journal each hour for one predetermined day. Other activities encouraged students to contrast and compare architecture, weather, and sports around the world. Fifth graders in the "Dropout Prevention" class collected favorite recipes from their international key pals and published a popular ***International Cookbook***.

In May, recognition for the end of the year is observed with the ***Kidlink Big Days Celebration***. For three days, fifth grade students used the ***Kidlink Internet Relay Chat*** (IRC) to converse electronically in real time with peers from around the world. This celebration helped improve map and writing skills, and knowledge of multicultural diversity. It was exciting to hear students talking about how kids in other countries are just like us!

Illinois
At the Baker Demonstration School (BDS) of National-Louis University in Evanston, electronic mail (e-mail) projects are an extension of the continuing philosophy that guides the teaching of K-8 students. Students construct their knowledge in a collaborative environment and the Internet only provides an international avenue for more collaboration.

The BDS social studies teacher said: "In addition to all the facts and feelings gleaned from communicating with kids their own ages worldwide, students also learned the intricacies of sending e-mail and attached files." Additionally, keyboarding skills have seen marked improvement, which we attribute to the high interest in this communication. Spelling actually improved too, as kids corrected each other before sending messages, since no one wanted the other kids to think they couldn't spell. Our students' perspective on world cultures has broadened, even if only in subtle ways. Students are more interested in reaching out to and discovering other cultures as a result of this extraordinary technology.

During one activity, seventh graders explained the use of e-mail to undergraduate and graduate students. The excitement of the middle school teaching guides ignited interest in most of the college students. By the end of the first session, each college student was able to correspond with the professor, classmates, a seventh-grade buddy, and an electronic newsgroup. Collaborative efforts locally and globally are engendered with Kidlink activities.

Texas

At Nacogdoches High School, Kidlink activities are used in the study of U.S. history. This unique approach requires higher levels of cognitive thinking and empowers students to take an active part in the study of history.

Telecommunications introduces students to resource materials available for conducting historical research and helps students develop a better understanding of U.S. history. By using Kidlink, students gain a better understanding of their own culture as they explore other cultures. Student comments exemplify their learning: "It helped me become less prejudiced about others." "We got to talk with kids from different parts of the country and learned how they act and think." "I liked learning about the other people." "What we did was fun, and we got to experience communications in a new and different way."

Massachusetts

In Amherst, undergraduate and graduate students in education at the University of Massachusetts learn the skills of finding information from worldwide resources and learn to relate to people elsewhere in the world. Kidlink lists are integral to these studies. Of the many lists and newsgroups available for educators today, Kidlink is the closest to the "Heart" in orientation, while still retaining a "Mind" component, an intellectual connection and process evident throughout the projects.

Unlike projects monitored and presented by many providers, Kidlink is a relatively free and entirely voluntary association. Since no one is paid to keep activities on target, the emergence of an effective group communicating in a new way and working together is particularly noteworthy.

Internet Tools

Intelligent Tools for Network Learning Environments

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Key words: networks, learning, tools, hypertext, project-oriented

Abstract

The expanding use of electronic networks for educational uses requires not only easier-to-use tools for students and teachers but also more powerful tools for managing and monitoring the complex interactions that develop. We will describe several tools that we have been developing and present data on their use.

As access to networks becomes more available to teachers and students, there has been an increasing recognition of the need for easy-to-use communication tools. However, as access becomes easier, more and more people are becoming overwhelmed by too many electronic messages, too much information, too many discussion groups. It is becoming increasingly apparent that we need not only easy-to-use tools but also tools that give us more power for organizing, storing, retrieving, and handling the information. In this presentation, we will describe in detail some tools that we have developed, and we will present data we have collected of the use of these tools in educational settings.

One of the most exciting educational uses of electronic networks is as a medium for conducting distributed projects. Our studies have shown that these projects go through a series of stages and that different kinds of organizational activities are required at each stage for the projects to be successful. These projects require that previous messages be maintained and used to track the progress (or the lack thereof) of the project.

We have implemented a prototype electronic message system called the Message Assistant, which provides a set of project management tools that we have observed to be important in our studies of a wide range of educational network uses. It contains a set of hypertextual tools for organizing and cross-referencing messages, allowing the user to turn a message set into a knowledge base. It also contains a rule engine, to allow the user to process his/her messages, either systematically as they come in and go out or after they have been received.

We are currently exploring ways to have the Message Assistant work cooperatively with other applications, such as statistical analysis applications and information servers. In this way, users can assemble a suite of powerful applications that help them organize, track, evaluate, and document educational network projects. In this way, not only will they be able to draw upon the

rich resources provided by electronic networks but they will be able to do so in a way that does not overwhelm themselves and others in the process.

Project
Building a Network Community among Science Teachers and Interns

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Key words: e-mail, network-enabled simulations, network tools

Abstract

This project will discuss the ongoing progress of the National School Network Testbed project and issues related to training beginning teachers to use the Internet, findings from a districtwide survey of high school science teachers, and an analysis of e-mail messages related to this project. The National School Network Testbed began in August 1992 as the first phase of a large-scale research, development, and evaluation resource. The Testbed is addressing the mechanisms by which the educational network infrastructure can be scaled up to the point at which all teachers and students can participate in the information super highway. The project's goal is to understand how we can achieve universal access to network resources.

Approximately 100 teachers and other professionals participate in the eight projects that the Testbed comprises. Three of these eight projects will be discussed here. The Community of Explorers is a high school science project in which researchers at BBN and UCSD are investigating mechanisms by which high school science teachers collaborate in developing approaches to the use of computer simulations in their classrooms. InternNet is a teacher preparation project, headed by the Teacher Education Program at UCSD involving twenty graduate-level teaching interns and several of their university-based supervisors. San Diego City Schools supports a Copernicus server as part of its growing districtwide infrastructure. Teachers from the Community of Explorers and InternNet projects are among those who use the server.

The InternNet Project has been examining potential applications of Internet resources for beginning teachers. In 1992 the Teacher Education Program (TEP) began encouraging secondary teacher candidates to use e-mail to communicate with university faculty. To facilitate communication among students and faculty, e-mail accounts were established and access to workstations was arranged for students. Interns who had a computer and modem at home were given remote access accounts to facilitate telecommunication in the evenings.

In January 1994 a survey was sent to all high school science teachers in the San Diego City School District. The survey questions focused on teachers' general teaching, computer, and telecommunications expertise. Selected interviews and classroom observations were also conducted to verify survey data. Several of the teachers interviewed participated in the Community of Explorers and Supercomputer Teacher Enhancement projects.

The Community of Explorers generates network exchanges in the form of text-based messages and graphically rich science simulation modules. Mechanisms were developed for tracking these exchanges and analyzing the evolution and coherence of this distributed community. The corpus was examined for idealized exemplars of network interaction. The realization of this electronic interaction will be described in terms of communication structure, professional mentoring, and contribution to the science curriculum.

Paper

Plugging-in Beyond the Classroom: Homeschooling in the Information Age

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Key words: homeschooling, alternative education, parents, on-line systems, netiquette, civic networking, educational reform

Abstract

Parent-educators are making noteworthy use of telecommunications technology from their homes: constructing on-line communities and virtual support groups for information and curriculum sharing. This presentation describes the experience of on-line homeschoolers, their relationship to technological reform within traditional education, and their significance as leaders in using technology to explore the realm of education "beyond the classroom."

About the Research

This research grew out of earlier explorations into education reform undertaken during my graduate studies in the Interactive Telecommunications Department at New York University. After examining the overall state of crisis in the American public school system, as well as the benefits and challenges of integrating technology into the classroom, I considered that one of the ingredients missing from the education reform equation might be the degree of parental involvement in learning. How many parents were communicating with their child's teacher? Were parents reinforcing the learning process, especially in a positive way? Did they demand excellence from their child's studies? In terms of identifying the part that technology might play, these questions remained: Were families investing in the new interactive technologies aggressively marketed for their consumption? How were on-line resources used by parents and children from the home? Were these technologies being used for educational as well as entertainment purposes? Was not the gap between such resources available in the home and those found in the schools growing wider?

The ultimate goal of the research was to arrive at a deeper understanding of teaching children in our information age. Investigating the virtually unexplored junction of telecommunications and homeschooling has provided the means to record the experiences of "beyond-the-classroom" learning utilizing telecommunications technology. Moreover, the study of on-line homeschooling families offers an alternative perspective on the challenges of integrating technology into education, as well as some insights into the home-education market likely to be targeted b future interactive broadband services.

The primary method of investigation involved interaction and observation with homeschooling parents throughout a three-month period in public on-line homeschooling forums on CompuServe, America On-line, and the Internet. Electronic mail exchanged on a private, individual basis was occasionally used as a secondary means of gathering data. Formal questions were posed to parents at times, but on-line dialogue was allowed to take its natural course as much as possible. In turn, the individual voices of the homeschooling parents provided a rich array of anecdotal information. Frequently, the on-line interactions with parents leaned closer toward the personal than the scientific. Establishing a bond of trust between researcher and subjects became a prerequisite to the gathering of any data.

Background: Homeschooling

Statistics

Historically, most elementary schools in the United States were either private or home schools through the latter part of the nineteenth century. Following the advent of the public school system, however, homeschooling was almost entirely nonexistent until the 1960's, when a renewed interest in alternative educational styles contributed to a rebirth of the homeschooling movement.

By 1978 the number of homeschooled children was estimated to be 12,500 (Lines 1991). Today it is estimated that at least 500,000 children in 250,000 families (Ray 1994) within the United States are homeschooled, although some have speculated that currently there may be as many as 1 million homeschooled children in the country. Homeschooling is legal in all fifty states (and Canada); however, statutory requirements as well as cooperation from school administrators and boards vary from state to state. In short, parents who have chosen to homeschool take full responsibility for the education of their own children.

The choice to homeschool is extremely personal, and parents have decidedly different reasons for teaching their own children. The majority of families—an estimated 80 percent—decide to teach their own children for religious reasons, in order to ensure that their strongly upheld beliefs and ethics are transmitted to their children. Others have related that they have embraced homeschooling as an option after experiencing "unacceptable" public school situations ranging from unchallenging teachers to a physically threatening environment. The choice to homeschool is also accompanied by the propensity to embrace a family-centric way of life that emphasizes togetherness. As one parent wrote, "I think homeschooling should provide the time to deepen family relationships, train children, and simply enjoy the here and now."

Learning Philosophies

Fundamentally, homeschooling parents surveyed are largely opposed to an educational style that treats the majority of children the same—"cookie-cutter" style. Homeschoolers commonly believe that "education is best managed (locally)" and without a single set of regulations. They see every child as unique and thus in need of individualized attention; they believe that a single "dogma" is sure to fail.

For homeschoolers participating in this study, there are no boundaries to learning. They claim that children seem to learn "almost by osmosis" from natural learning opportunities surrounding them. These "unschooling" parents do not make distinctions between "academic" subjects and other activities that they consider to provide learning about life: cooking family meals, sharing household chores, participating in volunteer work, helping with younger siblings, studying the Bible, and praying. Homeschoolers are great advocates for multi- and cross-disciplinary study. Parents stressed that life is "one whole experience" and that learning is counterproductive when compartmentalized into history, English, physical sciences, art, music, and so on. Learning is frequently not limited to the "home" as parents plan a variety of field trips either alone or with other families to local businesses, museums, nature and science centers, and other educational sites. They strive for equilibrium between creating a structured learning experience and providing enough freedom to enable their children to become self-motivated learners.

Homeschoolers enjoy citing their indisputable track record of academic success, with children often spending only two hours on their studies per day with as much individual attention as needed, compared to the average school student with an eight-hour day, who interacts no more than 15 to 20 minutes per day on a one-on-one basis with his or her teacher. Homeschooling parents often aren't certified to teach but know that they can find the expertise that they lack. The parents surveyed largely perceive themselves as facilitators of their children's learning rather than as "experts."

On-line Homeschoolers

To a large extent, electronic networks seem to be providing what John Holt ultimately envisioned for a homeschooling community: "a safe, interesting place where people can gather."

Resources

The three largest commercial networks in the United States—CompuServe, Prodigy, and America On-line—as well as the Internet, have specific sections for subscribers who are homeschoolers or who are interested in homeschooling. There are also burgeoning homeschooling areas and systems with the potential for much more activity by homeschooling parents on low-cost local and statewide community networks such as the K12Net "echo" on the Fidonet network, Big Sky Telegraph, TENET, the national system of FreeNets, as well as a handful of small, independently operated bulletin board systems (BBS) around the country.

On-line Population/Usage

Overall, there is every indication that the on-line homeschooling population is growing rapidly, even though there are probably no more than 5,000 families on-line. The Home-Ed list on the Internet tripled in size in a 14-month period, from May 1992 to July 1993. As of January 1994, more than 450 people had subscribed to the list (Home-Ed FAQ, 1994). On CompuServe and America On-line, the Home Ed/Homeschooling discussions have become the most active areas in their respective Education/Parent forums. For example, during the period of this research, about one-third of the total EdForum traffic on CompuServe occurred in the Home Ed section—an average of about 110 messages posted per day.

Demographics

Statistical data were hard to come by, since information about network users is not made readily available. Based strictly on anecdotal evidence, it appears that the vast majority of on-line homeschoolers are white and middle-class, within the childbearing age group. A great many are practicing Christians; however, there may be a greater proportion of *non-Christian* homeschoolers on-line relative to their minority representation among all homeschoolers. Homeschoolers participating in the forums live across the entire U.S. and Canada, with an occasional member from a European country. It is somewhat easier to define usage by gender, although establishing exact figures on male and female use will require further analysis because couples often share the same account or screen name and sometimes don't sign their name at the end of the message. This study found that women are more generally—but not always—the primary users among homeschoolers. On America On-line, for example, the forum leader suggests that only 25% of the posts in the homeschooling forum are written by men and that 44% of participants in the live homeschool chats are men. However, more men are posting in

CompuServe's homeschool forum and the Home-Ed list on the Internet, where there are more topics not specifically about teaching—such as politics, religion, and cultural issues.

Attitudes

While some parents have reservations about the expense of their network use, they seem to weigh cost against convenience and quality-of-life factors. When asked about whether time spent on the network interfered with family life, parents offered individual ways that they fit on-line time into their daily schedules and family time. Indeed, regular users revealed that they had to log-on at least once or twice a day and that it was time well spent. As one parent wrote, "For me, [the forum] is a place where I've made friends who really care about me and my family. It's a place to share both successes and failures, sorrows and joys, and receive the responses which help me celebrate and cope with these aspects of my life."

Critical Network Use

Among the parents represented, computer networks have been most widely used for sharing curricula and ideas for teaching, as a means for ongoing discussions with peers, as a virtual support group, and as a way to find out more information about homeschooling. It is not surprising that these purposes ranked the highest in order of importance; homeschoolers usually do not have institutional support in close proximity on which to rely for curricula (although some do use formal materials from correspondence schools), nor are they free to visit with their peers on a regular basis, because of the demands of teaching their children. The on-line forums are tremendously important in that they have dispelled isolation to a certain degree by enabling homeschooling parents to receive constant support and companionship without having to leave their homes. Homeschoolers scattered around the country are likely to gain their sense of empowerment, authority, support, and confidence from being in contact with other homeschoolers. In the past, this sense of unity and belonging was achieved only by joining a specific organization or local support group, but now computer networks are allowing new possibilities to emerge and even to substitute for old methods of support. This was shown to be particularly true in cases when families don't feel comfortable joining a particular group or even when families travel or relocate and wish to maintain a continuous source of support.

Additionally, homeschoolers ranked access to electronic libraries and archives fairly important in terms of their network use. Permanent files and resources continue to be cultivated and maintained and the future will likely find homeschooling organizations and curricula providers involved in this on-l development. Already correspondence course providers and CD-ROM publishers are lurking on the forums and making available information about their resources. On the commercial services there are "classified" areas in which vendors are permitted to post—or "advertise"—information about their products.

It is also clear that on-line technology is providing an outlet for political advocacy and organizing among homeschoolers. In March, homeschoolers used the network to spread information that led to the defeat of an amendment to the Improving America's Schools Act of 1994. Although homeschoolers generally ranked advocacy fairly low in terms of importance, it is likely that on-line communication will be used in the future as needed to organize homeschoolers into a collective force against any perceived threat to homeschooling. While such use of the technology is commendable, the study found that on-line advocacy should be approached with great care and responsibility in order to avoid exaggeration or the spread of misinformation.

Finally, almost half the parents responding to a survey during the research period ranked business or other interests as a priority among network usage. Some parents were using computers before they had children. Quite a number of parents on the Internet have access through their employers or through a university and said they use the network for business-related activity.

Homeschooled Children and Computing

One of the first assumptions upon entering this research was that this technology would be used *more* by homeschooled children and to a lesser degree by their parents. The situation is actually more the opposite. Based on the research, homeschooling parents are predominantly using on-line services for their own purposes, albeit largely in the service of their children. Homeschooled children are using computers, but more for off line activities ranging from using educationally-oriented software and game software, interactive CD-ROM programs, word processing or even authoring (programming) software.

Of the children that are *on-line*, parents reported that they use the network for informal things like exchanging e-mail with pen-pals, participating in real-time chats with other kids (both home and traditionally schooled), using news services, tracking sports information and hobbies in special interest forums, reading Miss Manners, or entering on-line contests. Occasionally, a homeschooled child will join in on an adult conversation about a topic of interest. For home-schooled children in particular, establishing on-line mentor relationships may be of great interest, yet the possibilities have hardly been explored. (One exception involves a remarkably gifted eleven-year-old with cerebral palsy, who socializes with other children in the Mensa forum on CompuServe and has embarked on long discussions with adults in various forums, including the Science/Math Ed forum, the Religion forum, the Literary forum, and the Disabilities forum.)

Why are there so few homeschooled children on-line at the present time? There are a number of possible answers to this question:

- The majority of the parents in the self-selected sample have children too young to really make the most of on-line resources.

- Parents are concerned about the inappropriate and adult material that is easily found on networks.

- Use is driven by need. Despite the few homeschooling parents who have found that technology vastly improves their children's learning experience and capacity, it is likely that the need for telecommunications for other homeschoolers may not be as great or as obvious or realized.

- The expense of electronic delivery of educational materials may be too high for single-income families footing the bill for all of their educational expenses.

- Parents don't want their children to rely too heavily on the computer. One parent making a living as a UNIX engineer severely limits computer use out of the fear that his children will become addicted. Another parent explained that his children simply spend the majority of their time discovering "real life."

Network Dynamics

Leadership

This study has found that the way a forum is moderated—or not, as is the case with Home-Ed on the Internet—contributes tremendously to the overall tone and sense of community developed within the group. Overseeing any list on the Internet is a monstrous task, which explains why the majority of discussion groups on the Internet—including the Home-Ed list—are "self-policed." This is to say that its members take it upon themselves to set the rules of conduct and the flow of debate. The unmoderated Home-Ed listserv, like other Internet lists, is somewhat plagued by a tiresome pattern of existence: repetitive questions from new users (no easily accessible archive); a re-hash of the same discussions that have occurred previously on the list leading to the same "flame-wars," and finally a migration of users as they either start their own groups or leave the group altogether. When the chain of events reaches a crisis point, the joy of participating in the list may be diminished and an unpleasant atmosphere created.

This research found that unmoderated forums don't have the same camaraderie and give- and-take as moderated ones. Yet, even among moderated forums, it takes a special type of person to develop and cultivate a place that is open and not too strident. Leaders must be welcoming and provide tireless encouragement to new users; it also helps to have a larger-than-life sense of humor and be able to take everything in stride. A good leader willingly embraces the challenge of instilling in the forum a friendly, generous tone that builds trust and respect among its members. A leader acting as a facilitator and peer rather than the primary authority figure in the forum is found to make an enormous difference in the interactions among members.

Forum Structure

Differences in the technical structure of a forum can potentially affect not only the frequency with which members respond and maintain conversation but also the content of messages themselves. Of utmost importance is the flexibility to upload and download messages as well as to utilize special software to keep track of all forum activity and reduce connect time (CompuServe) rather than have to read, message by message and folder by folder, the posts while connected (America On-line). It is also likely that writing off-line may generate more thoughtful or lengthy replies, since the user isn't worried about "the meter ticking." Furthermore, having the freedom to generate a "folder" or subject for discussion rather than conforming to set categories enables forum members to feel that they have ownership in the forum instead of being obliged to engage in a predetermined discussion category. Overall, it may be inferred that the most successful forums will be those that members feel they help shape.

Flaming

As is the case in the non-electronic world, homeschoolers maintain very diverse philosophies and beliefs within an on-line group. The greatest challenge for a homeschool forum may very well be to prevent divisive battles between liberals and conservatives, "traditional homeschoolers" and "unschoolers," and fundamentalist Christians and others. On the whole, people give each other space and the respect they need for cohabitation on the network; if there's anything that will cause strife in a forum, however, it will be when the discussions veer too far away from homeschooling and towards extreme political and moral debates that many feel are not really central to homeschooling. Within a group of people who hold their political and philosophical ideologies so close to heart, one of the greatest difficulties for some on-line homeschoolers is allowing multiple views to exist without attempting to indoctrinate others.

Lurkers

In general, the contributed notes to homeschool forums are posted by a small group of regulars who tend to be more outgoing and jump into most of the conversations without prompting or invitation. The vast majority of forum members—perhaps as much as 80 percent—are classified as "lurkers," people who observe, but don't speak. Reasons for lurkers reluctance to post include: (a) shyness; (b) a belief that they aren't knowledgeable enough/don't have enough information to post; (c) feeling overwhelmed/not enough time; (d) feeling as if they still are learning the ropes; (e) fear of losing their anonymity or that something they write would be transmitted to some undesirable place/person(s). The research concluded that the key to a successful on-line experience may be something different for each homeschooler: some may feel the need for a constant, interactive rapport with everyone, yet others still feel they are a part of the forum even though they may sit quietly on the sidelines.

Technology, Education Reform, and Homeschooling

As strange as it sounds, educational technology and homeschooling ultimately share a common vision. What is hoped to be achieved through the use of technology in public schools has already been achieved in homeschooling situations, regardless of hardware. In the face of challenging public school conditions, the possibilities assigned to the technology—collaborative, self-paced, multidisciplinary and/or hands-on learning, mentoring with adults beyond the classroom, and other new ways of gathering and processing information—are leading some school reform efforts and generating hope for educators. However revolutionary this may seem, these learning styles have already been realized and mastered by homeschoolers—if only because the one-on-one nature of a homeschool lends itself to such dynamics.

Vice President Gore's vision of a schoolchild being able to come home after school, turn on her computer, and plug into the Library of Congress is an ideal example of the irony present as one considers homeschooling in the context of such future notions as the "information superhighway" and "classroom without walls." There are parents who have already seized Gore's "Library of Congress" dream—if not through the ideal technological link, through their a philosophical choice. Homeschoolers have succeeded in providing a rich learning environment for their children, full of choices and complete with global, "beyond the classroom" perspectives and individual and self-paced learning opportunities. Gore and many others clearly anticipate the home's becoming an educational center of importance, equal to—or greater than—K-12 schools. Thus, parent-educators at home should not be disregarded. The challenges and barriers they must overcome to get on the "superhighway" will be similar to those of any parent who will eventually connect to provide his or her child access to the "information highway."

Currently, there is very little evidence indicating that proponents of the "globalization of education" are expanding the scope of projects and usage to include home educators (not affiliated with any institution) who are *already* teaching beyond the classroom. In fact, as the majority of innovative networking is beginning to occur within schools, it is questionable whether future opportunities will be lost for homeschoolers. Nevertheless, some homeschooling parents participating in the research were skeptical that schools would lead the way, implying instead that telecommunications technology will provide parents with greater opportunities and relegate the "monolithic" public school system to antiquity.

As telecommunications technology is deployed as a delivery system in support of education in schools and the home, what will distinguish distance education from homeschooling? Distance education is generally classified by its association with a supervisory institution of some kind, which lends a degree of authority that has been responsible for establishing legitimacy for this type of educational delivery system. More and more, however, the labels and compartments we have created will need to be reassessed and assigned new meaning. Already many homeschooling parents are associated with accredited correspondence schools, utilizing the available curricula and allowing their children to work with the school's teachers. Also, physically or mentally challenged children are beginning to use telecommunications technology for educational purposes; in the future, will we classify these children as homeschoolers or as distance learners?

Contrary to an initial hypothesis of this study, little evidence was found to suggest that on-line communities might help to narrow the gap between home and school educators and that both would contribute further to the common goal of developing "beyond the classroom" learning experiences. Bridging the tremendous philosophical and political chasms between homeschoolers and traditional educators will take a great deal of perseverance as well as greater acceptance of homeschooling by the public school community. Some of the major conflicts identified include the following:

- Public school teachers harbor resentment toward outside criticism and grow increasingly defensive when the circumstances under which they teach are impossibly compared to homeschooling.
- Homeschoolers do not compromise their belief that parents are much more capable of teaching their own children by virtue of love and appreciation for the individual child.
- Public school educators do not recognize that parents can be credible and capable teachers.
- Some homeschooling parents criticize public school teachers for being "lazy, incompetent and uncaring" without understanding the frustrations of trying to meet the individual needs of thirty children, while keeping up with a great deal of paperwork and dealing with discipline problems.
- Some traditional educators believe that homeschooling is a form of child abuse.
- Many people wrongly assume that homeschooled children are socially deprived. (They are, in fact, actively involved with many activities and people beyond the homeschool.)
- Policymakers rarely acknowledge and accommodate the notion that it takes many styles of learning and "classroom" situations to fulfill the needs of all children.
- The lack of "open" schools that allow homeschooled children to use the same resources as the full-time enrolled students—i.e. library, computer labs, textbooks, science kits, athletic leagues, clubs, field trips, and other extracurricular activities presents difficulties.
- The establishment of tax breaks or other provisions to assist parents with the burden of all educational expenses would facilitate wider choice. (Homeschoolers pay the same school taxes as everyone else regardless of whether or not they can access resources affiliated with the public schools in their area.)

The Future

On-line Homeschoolers

It is conceivable that telecommunications, with its capacity to connect people worlds apart—philosophically and geographically—will eventually provide a means for homeschooling to be seen in a more positive light. One of the most interesting possibilities for homeschoolers in terms of future networking is the potential to tap into developing statewide or local civic networks. However, there are few policies in existence that establish special provisions for homeschoolers, and in some cases, such as the Virginia PEN educational network, access is strictly limited to users affiliated with public schools (Loss-Cutler, 1994\; Carnegie Mellon, 1993).

Whether telecommunications technology will catch on among the majority of homeschoolers is unknown. Barriers to the wide adoption of on-line services might include the fear of/unfamiliarity with technology, the shunning of worldly information/media by fundamentalists, concern about the inappropriateness for children, or the conviction that "real-life" activities are more of a priority than those in Cyberspace.

Consumers of Interactive Home Services

The study revealed that even on-line homeschoolers are highly discriminating in terms of the presence of popular media in their homes. Parents were found to severely limit television viewing and especially avoid Nintendo-style video games in an attempt to avoid the perceived addictive and controlling nature of these technologies. Computers are often considered to be a mixed blessing—parents love them as informational and educational tools but find that it often takes careful setting of rules and limits in order to establish the sort of nondestructive behavior that will preserve family unity. Furthermore, a review of some of the off-line literature suggest that there is every possibility that off-line homeschoolers may even feel more strongly about technology use in their homes. On the whole, parents revealed a certain degree of skepticism about the arrival of interactive television in their homes; their concern ranged from the belief that the offerings will not be of quality and substance to the notion that interactive TV will be another means of controlling citizens and will ultimately impinge on their privacy. In short, among a group of families who have taken great steps to provide an educational environment removed from the mainstream, the vision of a 500-channel world may simply not hold much allure.

Conclusion

The ultimate challenge for the future of education lies in the willingness to be open to all options, perspectives, and solutions. Surveyed homeschoolers have expressed their firm belief that homeschooling will continue to thrive and that new technology will serve them in their efforts. This research has provided strong grounds for believing that homeschoolers will create and sustain successful on-line communities for themselves and for their children in years to come.

References available from author.

Special Projects

The ENAN Project: American Indian K-12 Education in the On-line World

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Key words: American Indian, modems, Internet

Abstract

This session will highlight the Educational Native American Network (ENAN), which brings networking services to American Indian students, teachers, and administrators in schools operated by the Bureau of Indian Affairs, Office of Indian Education Programs.

In short, the ENAN Project's goals are (a) to deliver educational technologies to OIEP schools and (b) to promote and assist in their use, once available. When it comes to accessing the on-line world, these tasks are accomplished by combining older technology (modems and phone lines) with fairly current technology (fiber optics and the Internet). Together, these technologies form a conduit for information flow between reservation schools. To facilitate the flow, on-site training is provided to teachers and students.

The presenters will deliver a verbal description of the ENAN BBS, which is the project's primary delivery vehicle. A demonstration will follow. Following that, a question-and-answer session will focus on problematic situations within the educational technology portion of American Indian Education. The presenters will address such issues as "keeping up with the Joneses," "there's nothing to it; all you do is. . ." and "accessing the Internet and other on-line services in BIA–OIEP K/12 schools."

Project
An Educator's Day in eWorld: Resources for Staff and Students

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Key words: eWorld, telecommunications, resources, training, curriculum, collaborative, Apple

Abstract

Follow one educator through a day in eWorld—a vibrant, interactive community of real-time educators, students, information providers, and support people. Learn how the school's curriculum, finances, and staff training are enriched by accessing a worldwide community of colleagues, grants professionals, user groups, and experts in technology, science, equity, and more.

eWorld is Apple's new, user-friendly telecommunications network. In addition to the usual on-line information databases and resource files, the school has discovered an exciting community populated by knowledgeable colleagues who roam the streets of eWorld's metaphoric neighborhood.

You'll find eWorld is easy to use, fun to navigate, and a powerful resource for preschool through college educators. In eWorld's Learning Center there are lesson plans, technology plans, software evaluations, free/inexpensive resource information, home/school connection ideas, live conferences, educator interest groups, and more. It's a community designed for and developed by educators.

Tour the eWorld Learning Center with an educator, an on-line education expert, and an eWorld manager, who will all lead you through a sample school day of making connections. The itinerary includes:

- *glimpsing "Kids in Business World," an ongoing curriculum project that evokes new visions of learning and teaching. As one student asked, "This really isn't school, or is it?"*

- *using e-mail and participating in discussion groups that enable the school to interact with a community of educators who communicate regularly on topics from textbook selection to discipline.*

- *visiting Grants Central, where we will pose a funding idea to the on-line grants expert and check for answers.*

- *attending a real-time, on-line mini-forum with educators who are discussing a compelling educational topic.*

Discussion side tours also include:

- *visiting Apple Global Education Forum, which features collaborative projects, student newsletters, worldwide weather studies, global chain essays, and electronic penpals.*

- *dropping by the User Group Forum, which offers no-budget/low-budget technology support to education.*

- *window-shopping at "education resource outlets" to stock lesson and technology plans, science resources, staff training suggestions, competition/contest information, free materials, and Apple program/project information.*

- *learning to create pathways to your own world within eWorld. See how you can join an existing education community or establish a new education province that meets your specific needs.*

Join our guides along eWorld roadways that lead students to students, teachers to teachers, schools to schools, schools to families, and families to learning with their children through an enticing and simple interactive interface. The resources are abundant, and the people are practical, everyday experts ready to share their discoveries and success stories. The session focuses on demonstration and discussion of how one school became an active part of a learning community that stretches beyond classroom walls. They'll show you how the model can work for you.

Paper
Pebbles, Pictures, and Modems: Tools for Representational Thinking

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Key words: distance learning, cognitive development, evaluation

Abstract

Tools have been important in supporting human development and learning since earliest times. The advent of the computer has given rise to the development and application of many aids to learning. Increasingly, telecommunications has been used in classrooms to exchange data, collect information, and communicate on a wide variety of subjects. However, the models for classroom telecommunicating are often based on adult models of learning, and more attention has been paid to hardware issues than to evaluating the impact of telecommunicating. The work of Irving Sigel and his colleagues (1984) provides a framework for developing telecommunications-based lessons and evaluating the impact of those lessons.

Tools for Teaching and Learning

Ever since humans fashioned a hammer or knife or wedge from the stones in the Oldavi gorge, tools have served to extend and enrich human thinking and action (Bruner, 1964). Soon carts, carriages, and cars propelled us faster than feet; telescopes extended the reach of the eye; the pen and paper reduced the need to hold all information in memory. Pictures have been used—especially in the days before printing became a source of information—to instruct people. Today modems have become instructional tools deemed as important as the wedges made in the Oldavi gorge or the pictures created to instruct a non reading public. Distance learning—the use of telecommunications to link educators with educators, educators with students, and students with students—holds promise for continuing the contribution of tools to human performance. A major dimension of telecommunications is the increased possibility for public, shared dialogue, data exchanges, and problem investigation.

Viewpoints on Teaching and Learning

Jerome Bruner, long a researcher in the development of thinking, has commented on the role of the public shared nature of information in promoting the construction of meaning (1990). Bruner is part of a psychological tradition that believes intelligences— meaning performance, learning, and knowing—are constructed. That is, we do not photocopy information and immediately apply it to our repertoire. Bronowski, for example, says, "When we look at what the eye does, we become aware that it interprets the world from the outset by a process of inference. Perception itself is a mechanism in which sensations are instantly interpreted by an inferential process" (1978). This is in line with much of Bruner's early work on the way the mind "tells" the eye what to see.

We also know that we do not necessarily share the same meaning as the speaker or the writer; instead we construct what we think the meaning to be, and that construction is based on our previous experience and our level of cognitive functioning. Bruner says that by virtue of participation in our culture, meaning is rendered *public and shared* (1990). Meaning doesn't come pre-wired—the ability to mean may be pre-wired—but meaning, it seems, is constructed by each of us, and while there will be concurrences of meaning—because we are sharing experiences—it is also possible that there will be gaps and differences in my thinking and knowing compared to yours. And this is not due just to the so-called "ability levels" of students. It also has to do with preferred styles of thinking and learning (Kagan, Moss, & Sigel, 1973). So we have to actively grapple with novel information to incorporate that information into our thinking, reasoning, and acting. Samuels (1970) cautions us about the act of learning and the role of pictures as tools for learning. The oft-held belief that pictures in beginning reading books facilitate the interpretation and comprehension of the text does not hold up under scrutiny, according to his review of the literature. Instead, there may be idiosyncratic constructions of pictures from child to child. So we should carefully examine our assumptions about the impact of all sorts of learning experiences.

Similarly, Bruner is part of a psychological tradition that believes young students are not little adults—i.e., they do not have the same strategies, processing skills, or expressive abilities as adults. In this view—supported by an entire research tradition (Mason et al., 1989)—it is not the case that students know less than adults do and incrementally add bits of knowledge piece by piece. Instead, says the research, children view the world differently from adults. They apply different thinking strategies, and they reason more frequently from concrete, not abstract, experiences. At certain points in the course of development children go through shifts in the way thinking and learning occur. So we must be careful about adult assumptions of how *children* learn from telecommunications.

The view that there are differences between children's thinking and adults' thinking has manifested itself in the development of computer-based tools. Programs such as **Lemonade Stand**, **Hot Dog Stand**, or **Oregon Trail** provide scaffolding for data collection and hypothesis testing. **King's Rule**, **Safari Search**, and **Blockers and Finders** "clothe" complex logic problems in concrete activities, and programs such as the **Supposer** series harness the computer's capacities to support the development of geometric play.

Much has been written of technology as a tool for promoting learning (Thompson et al., 1992), and within the last year or so we have seen an explosion of interest in telecommunications—which has lagged behind Logo, Micro-based Labs, etc., as appropriate tools for the computer classroom. With increased interest and activity comes the need for increased scrutiny. As a general rule, we find a continuum of sophistication with regard to educational issues. First comes the general introductory phase, when everyone discusses the materials and their operation. That is followed by questions about how the educational materials should be implemented. Then we should expect a phase when we ask, "What impact do the materials make?" So, given the increase of interest in telecommunications, it is a good time to ask what we expect of telecommunications.

Issues in the Current Status of Educational Telecommunicating

Issue 1. The prevailing models and activities in telecommunications are based on adults. Paulsen (1993), for example, has provided a major compendium of activities around which telecommunicators can organize themselves. Paulsen acknowledges that the activities—public tutorials, individual projects, free-flow discussions, etc.—are rooted in adult models of learning. Have we asked how effective those telecommunications activities are when conducted with young children? Do the same assumptions we make about adults' ability to learn from telecommunications hold for children?

Issue 2. The prevailing materials for the classroom use of telecommunications usually devote more time and space to equipment needs, configurations, on-line trouble-shooting, and protocols than to consideration of cognitive issues in the

construction of lessons. A review of materials for classroom teachers (ISTE, 1989; Andres, Jacks, and Rogers, n.d.) showed that little attention has been paid to questions of students' thinking as they prepare materials to be read by others distant from themselves or to students' construction of mental models based on information they receive from others some distance away. This is understandable given the short time during which telecommunications has been a topic of general educational interest and the complexity of the telecommunications process. Now that telecommunications is becoming a major component of many classrooms, it is time to move to the next level of implementation.

Issue 3. Few "model" lessons provide age-appropriate guidelines for evaluating the impact of the lessons on students. By this we do not mean, "How many months of growth in standardized test scores have taken place?" Those questions—inappropriate in almost any setting as single questions for evaluative purposes—are not the only questions that teachers can ask. But few, if any, telecommunications lessons suggest evaluative strategies for the teacher. In part, we suspect that this is because there is an assumption that the adult models of learning hold—i.e., if the activity has been engaged in, then learning has occurred; in part, again, it is probably a result of the comparative newness of educational telecomputing.

What is missing is a framework for telecommunications teaching and learning that is appropriate for young children. So we should look for differences between the adult model and the child model, and we should look for commonalities. Here's where work on a different form of "distance" learning—work conducted by Irving Sigel and his colleagues (Copple et al., 1984)—provides a framework for telecomputing educators who work with young (ages 5-15) students.

Sigel's Views on "Distancing"

Central to Sigel's thinking about information handling and information processing is the role which representation plays. According to Sigel "representation refers to the idea that a thing or a name can stand for something else." Those representations may be externals—i.e., a pennant one waves at a baseball game that signifies one's allegiance to a team—or they may be internal actions, images, or words that we use to depict for ourselves something we are knowing. Let's think about what types of representations students using telecommunications might create and use. We may ask them to create external representations of information they've collected and/or analyzed. For example, we may want them to draw a picture of what they think their pen pal's home or community looks like, based on information received from the pen pal. We may want the students to make a model of that community. We may also want students to create internal representations of data they receive via telecommunications. They may create visual images of the country where the pen pal lives. They may organize data in some form of mental graph or chart when they collect data on rain forests or acid rain, and then translate that data into graphs and charts they make themselves.

In Sigel's view, representational thinking develops. His work is concerned with *how* representational thinking develops and how we, as educators, can facilitate that development. So, taking Sigel's work into the telecommunications arena, we would suggest that telecomputing educators must not take for granted that as students communicate with pen pals, or as they collect data, or as they search information databases, they are working with the same degree of fluency as adults. Nor should we assume that students are representing the data in exactly the way it occurs in the "real" world.

According to Sigel, "distance" represents the separation of ourselves from the ongoing present. Sigel and colleagues view "distance" as the degree of abstractness of material. So the "real" thing is not distant; but a picture has a distance, and a drawing based on that picture may be more distant—i.e., less recognizable than the "real" thing; and a schematic sketch may be still more distant. Note that we're talking here about objects that can be physically present for the student—i.e., he/she can handle them, look at them, work directly with them. How much more distant is the verbal description of a pen pal's community or the set of numbers describing the amount of rain falling in a rain forest! Given that children do not construct the same representations of reality as adults do, what do we know of how students make sense of those representations? And what do we know of students' representations from material that is telecommunicated?

Sigel's suggestions for strategies to develop representational competence in children may be welcome additions to the set of skills that telecommunicating educators need in order to maximize the effectiveness of educational telecomputing experiences. So let's look at his suggestions for experiences that promote students' ability to separate themselves from the ongoing present and to make meaning from "distant" experiences. There are, according to Sigel, at least four types of activities that can occur in classrooms to develop students' representational competence: Engagement, anticipation, reconstruction, and transcendence. Let's take them one by one and see if we can apply them to the telecomputing classroom:

1. **Engagement**, according to Sigel, is developed by questions that start the mind thinking about something. So before we begin a pen pal exchange we might want to engage students in the possibility that there will be differences in the lifestyles, climate, customs, points of view, etc., of the community of students they will be chatting with. Do we pose questions about the relation of geography? The community may be located pretty far north (or south) of where we're located. What impact do we think the climate will have on dress, housing, travel, work, etc.? Before we begin a unit on rain forests, do we ask students to discuss what they think a rain forest looks like? Do they collect pictures and speculate about the temperature, humidity, sounds, smells, and sights? Do they draw what they think the rain forest looks like before they begin looking at numerical data? Do they construct models? By immersing students in the construction of "might be's" and "gotta be's"—"It might be pretty dark in there if the trees shield the sun, and if so, it's gotta be the case that it would be hard to see animals unless they were brightly colored." From those engagements, students can begin to start piecing together a chain of suppositions, hypotheses, and questions. Those suppositions, hypotheses, and questions then create a frisson for students—an urge to make sense of the disparate bits of information and weld them into a coherent whole.

In terms of evaluation of students' preparedness for the telecommunications activity, we can then ask ourselves: Are all students engaged? Have they all framed questions? Which students have developed a complex set of questions that seek to link lots of bits of data? Which students seem to have trouble framing questions? What is the source of that trouble—lack of motivation, lack of understanding of the task, poor strategies for attending to the data, etc.? Those questions aren't a bad way to begin to monitor students' involvement with the telecommunicating task, because if they don't get involved at the beginning, what can we expect of their continued participation in the project?

2. **Anticipation** is another strategy that Sigel recommends in the development of representational thinking. According to Sigel, anticipation is planning for the future. In the case

of a pen pal project, this might mean encouraging students to think about what they would like to know about their pen pals at the conclusion of the project, and what use they would like to make of that data. That's going to help them frame questions they'll ask their pen pals; that's going to help them think about sustaining a long-term dialogue with the pen pals, and perhaps planning to acquire supplementary data. For example, if I learn before I start that my pen pal lives in France, and I'm an eighth grader, maybe I might think I want to go to France one day. I might think it is important to relate my knowledge of France gained from my pen pal to looking, in the future, at France's performance in the World Cup games. By immersing students in "What might we learn from our French students? How might we make use of the information to (a) sustain contact with our pen pals and (b) enrich our own lives both now and in the future?" we may generate a commitment to the process of telecommunicating and to the information we want to make sure is collected from the telecommunicating project.

In terms of evaluation of students at this phase of the project, we can ask questions such as "Do students see links between the 'here and now' of this planned activity and their own futures or the future use of data from this project?" We can ask, "Who doesn't seem to realize that the data collection project will be ongoing and may affect students' own lives in the future?" and "Who doesn't seem involved in constructing for himself or herself a set of 'What I might learn from this experience' questions? " By asking these questions we might identify students who are just "surfing" through the project without being involved by it.

3. **Reconstruction,** according to Sigel, is thinking about the past. In this case, it may mean trying to make sense of the data collected through the telecommunications project. This calls for more than asking students to fill in a few blanks on a sheet of paper: "Who did I contact? Where do they live? What do they eat?" It means that we must encourage students to make sense out of all the bits of data they have collected. It means that they may have to tell their version of the "stories" they collected to themselves or to other students so that they make a coherent whole of the data. It may mean they have to draw pictures of what they think they've learned. It may mean they will need to construct models, or charts, or maps.

In terms of the evaluation of students' thinking at this stage, we may ask students, "What have you learned thus far?" and "What's puzzling about the data?" and "How would you tell or show or picture what you've learned to others?" We might ask, "What puzzles you?" and "What did you learn that you were surprised by, unprepared for, or confused by?" We might ask students to restate what they think they've learned to another student or to another adult. We might ask them to prepare a film, a multimedia project, a story, a play. In other words, we would like to see students reprocess the information across a wide range of media—speaking, writing, drawing, etc. It is probably at this point that we'll be able to see what students may not understand—and they may be unaware that they don't understand! We'll be able to see that some students have missed critical or incidental pieces of information. It is not inconceivable, for example, that students could correspond with a class of French students for a year and not realize that English is not the first language of those students. Trust me! It is not inconceivable that students can collect data on a rain forest and be surprised to learn that there are no corner groceries or video rental stores there. The act of reconstruction allows teachers a glimpse into students' conceptualizations of what they think they've learned.

4. **Transcendence,** according to Sigel, is the movement from the concrete to the symbolic. So if students by now have not written about the data, if they haven't constructed charts, if they haven't made schematic drawings, if they haven't made a series of "If, then. . ." statements—"If

the rain forest has annual rainfall of. . .then the following conditions there are different from here . . ." and "If French students study school subjects different from our own, then . . ." Transcendence is the time to move from the anecdotal—"My pen pal's father owns a vineyard"—to the conjectural—"If my pen pal's father owns a vineyard and several other students in my class also have family members involved in grapes and vines, how big a part of the French life is based on vines and wines?"

Evaluation at this point centers on questions such as "What do I think my students have learned? What have I learned about their learning or the gaps in their learning based on what I see of their symbolic representations of the data they've gathered?" and that translates into a series of "What do we need to do next to ensure that learning has occurred?" questions.

"Distance learning," according to Sigel, means that we "challenge students to think in the nonpresent and provide opportunities for alternative actions when students are unable to solve a problem." So by asking the students questions at each step of the process—engagement, anticipation, reconstruction, and transcendence—we're encouraging students to process information mentally or to work with symbolic codes. That's going to increase their internal dialogue with themselves and those processing activities are indispensable in the generation of alternatives. The generation of alternatives is, or should be, a significant feature of today's education.

Telecommunicating has been promoted as a motivating activity. Teachers cite the benefits that students gain from contacting students in other communities, the advantages of collecting data from around the world, the worth of having a worldwide reference library at one's keyboard. However, we also know that students differ in their commitment to school tasks, in their understanding of those tasks, and in their ability to transfer information gained from those experiences into a fully-developed repertoire of thinking and reasoning strategies. Only by completely immersing students in all aspects of "distance" learning—the development of representational strategies as well as the reaching out across the Internet—can we be sure that students are benefiting as fully as possible from their telecommunicating experiences. Since classroom time is limited, the expectations of society are great, and the need of students is pressing, it behooves us to maximize the telecommunicating experiences. It's time to move to another phase of educational telecomputing—one that connects students with their own thinking as well as connecting them with the world at large.

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Social Studies
Toss the Text: Telecommunications, Technology, and the New Social Studies

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Key words: social studies, telecommunications, learning centers, Internet, technology-integrated instruction, curriculum design

Abstract

This purpose of this project is to develop a 21st-century curriculum and classroom in social studies. This includes integrating computer and multimedia technologies and telecommunications to give students the breadth and depth of contact with and experience in the real world that they need to compete today and in the future. The project includes a learning-centers approach to teaching social studies. There will be a presentation detailing this curriculum, from classroom setup to lesson planning, including plans for expanding access to technology in the social studies classroom. This curriculum was implemented for nine weeks in the spring of 1994 with limited technology, and the results will be discussed in the workshop.

A major focus of this project is integrating telecommunications technologies in the classroom and the curriculum. The basics of hooking up a school and/or district directly to the Internet will be explained, and demonstrations of the types of materials available on the Internet and the ease of acquisition provided by programs such as Gopher/TurboGopher and Mosaic will be explored. In addition to the wealth of information available, student control over finding and retrieving that information fosters cross-curriculum, reality-based learning. As with the general curriculum design, lesson planning specifically for using telecommunications and other technology will be demonstrated and discussed. The use of a modem and on-line service (America On-line) in the classroom will also be covered. This model emphasizes student-centered learning and the ability to reach all the students in today's diverse classroom. Within a general focus on cooperative learning and practical application, technology and telecommunications are featured as tools to achieve the desired outcomes. ADA compliance is also included in this model. The ability of students to work at their own pace, do research in other languages, have contact with professionals in every field, and easily access primary and secondary source documents as well as other information allows students to take control of their education .

The role of the teacher changes as well, into more of a moderator and a group and individual facilitator. The teacher is no longer the primary source of information; rather the students are taught how to get the information they want and decide how to use it. This approach requires a change in evaluation and assessment, which will also be examined. As technology continues to advance, continued useful teacher training becomes essential. This is addressed in respect to new teacher training, continuing education, and inservice training and workshops. Well-known shortcomings of these methods, as well as solutions to the problems will be looked at.

Free handouts outlining this model of instruction, describing and illustrating Internet access, and personalized classroom designs using Computer-Assisted Design (CAD) will be available.

Remote/Distance Education

The FAST and BEST Program: Leading Faculty to Distance Education

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Key words: distance, education, multimedia, faculty development, video

Abstract

One potential roadblock to the successful implementation of a distance learning program is poor faculty attitudes. Fear of technology, anxiety associated with exposing their efforts to peer

review and worries about the extra effort required to produce telecourses can squelch enthusiasm and hinder implementation of telecourses.

A program at the Walter H. Adams Center for Teaching Excellence in Abilene, Texas, is helping faculty at Abilene Christian University to experiment with distance learning in a nonthreatening environment. Two components of the program encourage faculty to tape partial or complete segments of their classes for playback to their traditional students. It is hoped that after faculty become accustomed to seeing themselves on video and learn to deal with the minor changes to their teaching style needed to accommodate telelearning, they will develop a more positive attitude toward distance learning. The Faculty Academic Self-Taping (FAST) studio is available to all faculty for taping classes or portions of classes to play if they are absent.

The program emphasizes the instructor's ability to use standard classroom resources to tape a session quickly and easily. The instructor is seated in an office environment. A simple push-button switcher allows the instructor to switch between the camera, a videotape player, a computer, and a video overhead. The video overhead is used to allow faculty to show standard overheads, printouts, or a blank sheet of paper for use as a white board.

Studio time is booked in advance, and technicians are available to assist faculty in getting started. A brief training video is also available to acquaint instructors on how best to utilize the system. The focus of the FAST component of the program is on allowing the instructor to overcome the effects of time and distance by allowing him or her to continue class sessions while away from the campus. The FAST program stresses the instructor's ability to use standard classroom methods and media in a video format.

The Better Educational Self-Taping (BEST) Program emphasizes improvement of instruction using video. Instructors are teamed with staff members from the Center for Teaching Excellence to collaborate on teaching situations that could be improved or enhanced by using video. Emphasis is on finding situations that are difficult to recreate or are redundant. This has been particularly useful in situations, such as computer labs, where instructors must provide one-on-one instruction for chronological or stepwise tasks. Small and portable TV/VCR combinations are available for checkout to use in this type of situation. Instructors are encouraged to seek out alternate sites or settings to use in taping that would be impractical or difficult to include as field trips to traditional classes. Simulations and modeling are encouraged as videotape methods. When necessary, a collaborative team is formed to include drama, music, or graphic arts faculty to enhance the final product. The best of these tapes are highly publicized and promoted as models of efficiency and instructional improvement.

International Project
First Graders Take to E-mail: It's Possible and Terrific!

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Key words: e-mail, writing process, integrated curriculum, global education, elementary

Abstract

*Computer e-mail is a tool that teachers and students use to share and learn information from each other's educational and cultural experiences. The e-mail technology of I*EARN (International Education and Resource Network) is being used within the existing and emerging first-grade curricula.*

*On I*EARN, e-mail partners find compatible interests and areas of study within their curricula, from which their e-mail projects emerge. The projects generatively evolve from both the context and the culture of each individual classroom and from the collaborative communication between them.*

E-mail projects have multiple versions of implementation among the partnered classrooms because the composing, sending, receiving, and reading of messages emerge from classroom field trips, art projects, guest visitors, and journeys through children's literature. These many activities provide the commonly shared authentic learning experiences from which all the children can then share information and insights.

The actual writing process that the children use to prepare their messages can include:

1. *Conversations about project experiences*
2. *First writing using "invented" or "guess-and-go" spellings*
3. *Individual or small-group writing conferences with the teacher to extend and edit written text*
4. *Child's reading of text aloud to upload for sending*
5. *Child's re-reading of hard-copy computer text for final editing.*

*For first graders, the writing and reading of e-mail messages become integral components of the classroom literacy programs. The purpose of "writing to be read" by others provides genuine incentive and enthusiasm for literacy lessons as the children participate in I*EARN projects.*

At Sunnyside, for example, e-mail messages were uploaded and sent by the teachers. Messages were downloaded and put in large font for the first-grade readers. Computer programs such as Kid Works 2 by Davidson were used to compose messages and provide reading-group copies of the texts. Toward the end of the school year, the children began participating in the actual process of composing and sending on-line.

*Four examples of our Kimball/Sunnyside I*EARN projects include:*

1. *Water Habitat Project to learn about saltwater and freshwater environments and issues.*
2. *Martin Luther King, Jr., messages on the occasion of a national holiday honoring this African American.*
3. *Friendship messages and books that evolved from the Martin Luther King, Jr., messages.*
4. *Elder's Project, which included social studies focus on families, world and U.S. geography, storytelling, and letter writing among generations.*

The writings of first graders provide documentation of the purposeful educational value of e-mail.

"Sending e-mail helps me learn to read and write." "E-mail helps me make sense of my sentences. It makes me think about what I'm going to say." "E-mail helps me learn how to use the computer." "I like e-mail because you can learn about how people talk around the world. People learn about us by getting our e-mail." "E-mail makes your computer into a walkie-talkie so you can talk to people around the world. Then we can be friends and then no more wars will happen and there will be peace on earth."

*Our observation of first graders using I*EARN in the classroom curricula shows us that they assume e-mail is a way to learn in school. E-mail provides a way to learn to write and read, a way to share their worlds of experiences, and a way to learn from one another. With I*EARN projects, the first graders are using e-mail as part of their educational process to make a difference in understanding our living earth.*

Project
What Does Internet Access Give Students Access To?

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Key words: Internet, supercomputing, high school, computational science

Abstract

This panel will examine the impact of Internet access on students participating in the Adventures in Supercomputing program (AiS) sponsored by the Department of Energy. This program, which invites female and minority students into math and science by introducing them to the inquiry techniques of computational science, offers Internet access to students carrying out computational research projects.

Students with Internet accounts can work on distant computers, carry out research, gather resources, query experts, and collaborate with peers. They can also chat with distant peers, read newsgroups, or plunge into MUDs, MOOs, and role-playing games. How can teachers begin to define what activities are appropriate for their students? How can they encourage exploration of new environments and at the same time develop a sense of which Internet-based activities are productive and which are not?

We will address these questions from four perspectives.

- ***Teaching strategies*** *(Jill Snyder). In a program like AiS, the Internet is likely to be an appropriate resource for some aspect of student work. What options do teachers have for structuring student access to the Internet, supervising student activity, and encouraging creative use of available resources?*

- ***Student strategies*** *(Kallen Tsikalas). Little research has yet been done on the search and exploration strategies students employ when using the Internet. How do they structure their queries? What obstacles do they face? What discoveries do they make? Findings*

from a preliminary investigation of patterns of Internét use by AiS students will be presented.

- ***Program design.*** *(Richard Allen) The heart of AiS is supporting students in carrying out their own research. Internet access makes supercomputers in the Department of Energy's national laboratories accessible for student work, but it is also a promising venue for other research activities. How can a range of research options be supported by AiS while maintaining a focus on computing rather than telecommunicating per se?*

- ***Program evaluation and student assessment*** *(Katie McMillan). Teachers using telecommunications in their teaching report that telecommunications-rich activities are not well measured by traditional assessment methods.* * *How can we measure what students are gaining from their telecommunications-based activities?*

Panel Participants:

Richard Allen is a computational scientist at Sandia National Laboratories a member of the team that developed the AiS program. He is the program coordinator in New Mexico.

Katie McMillan participated in the 1993-94 evaluation of the AiS program.

Jill Snyder is a computational science teacher at Albuquerque High School in Albuquerque, New M.exico.

Kallen Tsikalas participated in the 1993-94 evaluation of the AiS program.

Social Studies
Using E-mail as a Constructivist Tool for Collaboration and Dialogue

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* Honey, M., & Henriquez, A. (1993). *Telecommunications and K-12 education: Findings from a National Survey*. New York: Center for Children and Technology.

Key words: e-mail, constructivism, telecomputing, telecommunications, student teachers, preservice teachers, collaboration

Abstract

Two projects involving preservice teachers using e-mail and a constructivist approach were conducted. Project TIE explored the development of collaborative K-12 activities implemented during student teaching. The other project used e-mail as a tool for reflective dialogue between preservice teachers and their professor.

Introduction

At Bradley University, several faculty in the Department of Teacher Education are exploring various ways of blending theory with technology. Classes are experimenting with a constructivist approach to the use of telecommunications. Two projects will be shared.

Project TIE

In Project TIE, the effectiveness of electronic mail as a medium for cooperative learning is being examined with a group of ten student teachers who use e-mail to involve their classes in collaborative activities.

The goals of Project TIE are to:

- Equip student teachers with knowledge and skill in telecomputing
- Conduct collaborative learning activities based on a constructivist theory among K-12 classrooms
- Facilitate professional interactions among student teachers
- Improve the connection between community K-12 schools and Bradley University
- Provide opportunities for inservice training for cooperating teachers.
- Strengthen student teacher links to Bradley University

This is an ongoing endeavor in which student teachers design and implement projects from a constructivist approach that can most effectively be completed using electronic mail. For example, students in a high school mathematics classroom collected data from the students in other classrooms involved in the project and used this data to further their understanding of statistics. Another student teacher's classroom was involved with the Illinois Rivers Project: the students wrote and illustrated children's stories with a common theme of water and sent these stories to an elementary classroom.

Several research questions are being examined:

1. Does the use of e-mail facilitate the constructivist approach to learning?
2. Does the use of e-mail help to involve those students who would not normally participate in class?

3. Can cooperative groups construct knowledge when they do not meet face-to-face?

Dialogue Journal Project
A second project has students using e-mail to construct a dialogue journal. Students in the cognate math course for early childhood and elementary majors "talk" with the professor on a regular basis. Some do this via e-mail and others use paper and pencil. The entries must summarize what was learned in class. They are also an opportunity for the students to pose questions. The overall question is whether this type of project helps students better understand that learning is enhanced by thinking about what one is studying. In the journals they must engage the math being studied if they are truly to learn it.

Three potential benefits are being explored:

1. Do the summaries help the students recognize the key ideas covered in a particular class?

2. Will students who are often reluctant to ask questions in class raise them in the privacy of a journal?

3. Can the journals act as a medium for correcting misconceptions and/or missing pieces of concepts in a timely manner? The levels of benefit for students using e-mail versus those using paper and pencil are being compared.

Summary
Both projects seek to explore the use of technology, specifically electronic mail, as a tool to apply constructivist learning theory in the classroom. Project TIE emphasizes collaboration among student teachers and their classrooms, and the Dialogue Journal Project emphasizes reflection between preservice teacher and professor.

Panel
"Save the Horned Lizard" Project

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Abstract
This interdisciplinary project will involve a pooled database, keypals, and mentoring. Seventh-grade classes will connect with other schools in the United States, Canada, Mexico, and Central America where the horned lizard exists to share information. The students will explore the reasons for the decline of various species of horned lizards. The on-line mentoring will also be provided through scientists at Texas A&M University via TENET (Texas Educators Network).

NEWTON: A Telecomputing System for Teacher Enhancement and Curricular Development

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Key words: telecomputing, technology, Internet, database, e-mail, NEWTON

Abstract

NEWTON is a telecomputing system designed, developed, and moderated by teachers of physics, chemistry, and physical science at the middle school and high school level. It is an e-mail system for teachers and serves as a database of field-tested experiments, demonstrations, and other classroom resources in biology, chemistry, mathematics, physics, and science education.

NEWTON was field-tested in 46 states by more than 900 users in its initial state from 1991 to 1993. Based on a commercial BBS, accessed via modem, and originally restricted to teachers from the NSF funded Project PIEDMONT, NEWTON was opened to the public during the last year and a half of the project to teachers of science and mathematics as well as to administrators. Comments and reported usage of classroom materials were uniform and positive: no other electronic resource of this quality is currently available.

NEWTON is now on a more robust platform and may be reached on the Internet. Its address is newton.uncg.edu . A faster and more elaborate version of NEWTON is currently being designed from the commercial product TeaMate. It is on a UNIX platform, sits on the Internet, and has many advanced features for educators, which will be explained and demonstrated.

Panel

Publishing on the Internet

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Key words: electronic publishing, hypertext, Mosaic, Gopher, K-12, curriculum, students

Abstract

As of spring 1994, there are more than 200 Gophers on the Internet offering materials for K-12 teachers and students, with others going up every day. The Eisenhower Clearinghouse, Scholastic Network, and many schools of education are posting education materials by teachers and authors on the Net. This spring, for the first time a K-12 school created its own WWW-server and Mosaic home page.

As Gopher, Mosaic and other tools make Internet publishing a possibility for teachers and students, what should educators know about posting their curriculum resources and student work on-line? What are the issues around the technology, around copyright, around royalties, and around identifying appropriate, high-value information?

This presentation will focus on the information management issues involved in creating an electronic education resource meant to be used—and created and contributed to—by classroom teachers and their students. The topics will include the relationship between information retrieval (IR) technologies and key word/field searches, information acquisition and presentation, the role of visual images and picture indexes, and the practical issues involved in moving from beta-testing to public access on the Internet (transaction management, user authentication).

An assessment of other development efforts for this community will also be mentioned. After attending this presentation, the audience will have a good sense of state of research and development in creating digital libraries for this community and some of the information management issues involved, and ideas of what steps to take and issues to consider in developing their own Internet publishing site.

The panelists are all creators of high-interest Internet databases and digital libraries for education:

***Brewster Kahle**, developer of the WAIS application and a tireless force in promoting Internet publishing and developing appropriate tools*

Susan Mernit, Director of Network Development for Scholastic, Inc., and the developer of the Scholastic Internet Center and Scholastic Internet Libraries

Michael Waugh, co-leader with Professor Jim Levin, of one of the nation's premier programs in educating teachers to use the Internet and publish education materials on-line

Len Simutis, Director of the Eisenhower Clearinghouse for Math and Science, a NSF and OERI-funded organization whose mission includes creating a national on-line database of citations, pointers, and full-text information on math and science curriculum.

Paper
Massive Introduction of Telecommunication within the Israeli Educational System: Prospects and Obstacles

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Abstract

This paper attempts to examine why the component of telecommunications within the five-year national plan, formulated recently by the Ministry of Education, is limited to rather a small number of schools, although considerable experience was gathered during the last seven years.

The new national plan, which took of last year to develop, was established, saying that all schools will have microcomputers by a ratio of ten pupils to one within a period of five years. The new plan took in consideration all the essential components involved in the integration of computers in the teaching process, such as hardware and software, computer communication, networking in schools, teacher training, R&E (research and evaluation), guidance, instruction, counseling, and maintenance.

Recent developments in the field of telecommunications, on one hand are offering efficient and sophisticated educational means but on the other hand are creating enormous problems, which can hardly be overcome by teachers and students at the present time.

Conclusions of this paper will lead to a prototype, based on the experience of a local educational network, which can assist teachers and administrators in introducing telecommunications within an educational system. The main concern is related to the extent of which schoolteachers can absorb information about a large number of computers in a short period of time (as prescribed by the five-year plan) and introduce them efficiently into their daily teaching by using recent telecommunication advantages.

Project

Modeling Teaching Strategies through Distance Education

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Key words: distance education, restructured classroom, computer conferencing, cooperative learning, active learning

Abstract

As increasing numbers of commercial and government organizations turn to electronic communications to conduct business, we feel that the opportunity to work together at a distance must be a vital component of our students' educational experience. Because computer technology gives students access to more and more outside resources and the ability to communicate easily with one another at a distance, educators need to reevaluate the way in which they teach. Using computer conferencing, the Department of Defense Dependents Schools (DoDDS) has developed distance education courses that require students to work together to solve problems.

In an effort to expose our teachers to this different teaching environment, DoDDS offers its distance learning courses to teachers as well as students. In addition, several new staff development courses model the use of a technology-rich environment. All courses are highly interactive (through an asynchronous computer-conferencing system) and are designed to place most of the responsibility for learning on the shoulders of the students.

Teachers often teach the way they do simply because they had good role models while learning their profession. DoDDS is committed to providing just such role models in its distance education offerings.

Introduction

The introduction of technology into the classroom has the potential to change the face of education in the United States. However, with few exceptions, teachers have been using technology to do "more of the same." It is only recently that educators have started to realize that with technology we can restructure the way we teach and the way our students learn.

What skills will our students need to function effectively in a technology-rich environment?

Before beginning any discussion of modeling teaching strategies, we must have a common understanding of what our goals should be. If the job of educators is to prepare our students for the working world they will face, we need to look at what our students will be doing.

Students will need to be "lifelong learners." The average American will change jobs seven times in his/her working life. Technology is changing the face of business so quickly that many people are constantly faced with learning a new body of knowledge just to keep up with the changes. Thus, our students need to be actively involved in their own learning. They must know how to search out information and apply this information to their jobs.

Today's students must learn to work together cooperatively. Many Americans who are fired lose their jobs because they are unable to work well with others. Successful businesses are finding that working together in teams is an important element in their success. Since these teams are sometimes composed of employees at different locations, the use of electronic mail as well as computer, video, and audio conferencing has changed the way we conduct business and work together. In order to function effectively in this new environment, students must be prepared to work with colleagues on the local site and at a distance.

So what will be the teacher's role?

A restructured learning environment must provide students with the opportunity to be active participants in their own learning and to work together cooperatively. Most of the teacher's time will be spent directing student learning rather than providing expert information. The student's access to information is no longer limited to the teacher's knowledge and the information in a textbook. Access to CD ROMs and the Internet now provide students with a wealth of information. Teachers must be prepared to teach students how to search through this information, evaluate its validity, and organize it in a way that will be useful to them and to others. Students also need to develop teamwork skills; therefore a greater emphasis on cooperative learning strategies should be an objective. Finally, students will need experience in communicating with others at a distance. Good communications skills are a must in a world where teamwork is so important.

How can distance education help in restructuring the learning environment?
Distance education has become an important component of American education. Many schools offer courses taught at a distance. However, the most common form of distance education, one- or two-way "live" video, does little to change the structure of the classroom. Interaction among students is often limited to two students talking to one another during a live telecast. Interaction between teacher and student is minimal.

Distance education courses can serve as an excellent model of how teachers can use technology in the classroom to promote active learning and teamwork. The Department of Defense Dependents Schools has adopted a model for instructional delivery of its distance education courses that provides the students with a very interactive environment. The backbone of the courses is an asynchronous computer-conferencing system called Confer II. Students use the system to communicate with the teacher and with other students. The courses are constructed so that the students are required to interact with one another in cooperative learning groups. The other components (or resources) in the classroom are videotaped lectures, a textbook, other students (both local and at a distance), tests, and assignments. Many of our students have also been given direct access to the Internet or an information service such as Dialog. Assignments are designed to require students to take responsibility for their learning by using these resources.

The students are guided through their learning by a distance education teacher. Some support is given at the local school, but essentially the student has control over his/her learning.

How can distance education model teaching strategies?
DoDDS is using this interactive environment to instruct teachers as well as distance education students. Teachers are encouraged to take the courses (Advanced Placement Physics, Calculus, and Computer Science) along with the students. In this way, they get firsthand experience in the use of a technology-rich environment. We then encourage the teachers to use these methods in their own classrooms.

In order to introduce teachers to the use of technology in a restructured learning environment, DoDDS is also offering staff development at a distance to its teachers. All of the courses offered at a distance are taught via computer conferencing or electronic communications. These courses require that the teachers work together to develop projects that they can use with their students. The reaction to the use of these techniques with teachers has been very positive. The ability to interact has created some side benefits as well. Many teachers use the conferencing system to share ideas, develop lesson plans, and discuss issues. This interaction has helped many teachers develop a team approach to their own teaching.

Conclusion
Teachers will naturally try to emulate the style of teaching they learned while they were in school. To expect them to change the way they instruct without providing some good role models is unrealistic. Staff development opportunities should demonstrate new teaching strategies through the use of new technologies. As distance education is possible in every school, what better way to model teaching strategies than to demonstrate them to our teachers in their own schools?

Remote/Distance Education: **Two-Way Interactive Video**

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Abstract

This session will b a demonstration of state-of-the-art two-way interactive televised instruction. The presenters wil' simulate the process of delivering wide-area classroom instruction using one-way video anc. two-way data and audio. The device creates a virtual classroom through the use of a computer developed by One Touch Systems in Santa Clara, California. The instructor in the video classroom manages the instructional process by calling on individual students, allowing students to "raise their hands" electronically, asking questions of all students (questions are answered by students using the multiple-choice keypads), and managing three-way conversation among participants.

Panel **How Can We Assure the NII Stays "User-Constructible"?**

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Key words: NII, publishing, Internet, constructible resources

Abstract

With the influx of the cable TV, entertainment, and publishing industry into the new enterprise popularly called the national information infrastructure or NII, there is increasing pressure to turn it into a delivery vehicle for programming.

There is counter pressure, however, to maintain the principle of two-way communication and the idea that anybody can be a producer of value. This panel addresses the promise of and impediments to what we might call "user constructability." While there is powerful pressure to turn the NII into a delivery vehicle for programming, there is also counter pressure to maintain the principle of two-way communication and the idea that anybody can be a producer of value. This idea is inherent in the distributed nature of the Internet but until recently has been the domain of Internet users with sufficient technical skills to program new information services. Within school telecomputing, there has been a strong tradition of teachers inventing their own collaborative projects and developing their own virtual communities. As schools join the Internet-based national information infrastructure, will this tradition continue or be overwhelmed by a combination of technical barriers to setting up Internet resources and an infrastructure designed more for delivery of information and programming than for interaction?

The members of this panel have been addressing this question from different perspectives and bring to the discussion examples of projects that are providing opportunities for participation by students and teachers while attempting to scale up to national scope. The issues addressed include: making a product of an interactive process, the influence of electronic commerce, the level of expertise required to participate, and the role of local area and district-wide networks in bridging between commercial offerings and local participation.

***Beverly Hunter** of BBN (Bolt Beranek and Newman, Inc., a research and development organization specializing in network technology and educational systems) has been researching the ways that students and teachers can create actual economic value through network activities. A former program director at the National Science Foundation, she is now a research scientist in the educational technologies department at BBN.*

***Al Rogers**, director of the Global SchoolNet Foundation, is nationally recognized as the leader of the grass-roots movement to create a widely distributed entrepreneurship among networked teachers. Among his many awards is recognition at NECC as one of the educators of the decade.*

John Lent is director of Scholastic, Inc.'s Scholastic Network, the first network service offered by a major educational publisher. He is the former publisher and editor in chief of INSTRUCTOR, the leading magazine for K-12 teachers.

Denis Newman, BBN, is a principal investigator for the National School Network Testbed, an R&D partnership addressing universal participation in the NII. He is an architect of the BBN Internet Server, a system designed to bring Internet services under the control of school personnel.

Panel
Telecommunications and Curriculum

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Key words: telecurricular curriculum, multiclassroom, telecommunications

Abstract

The Consortium for School Networking's Curriculum Committee members will share their diverse telecurricular projects, insights, and experiences. The following article appeared in the January issue of the Journal of the US Distance Learning Association.

Interactive reading and writing via on-line networks presents an unprecedentedly new pedagogy that is only now being acknowledged for the real depth of unique educational merit it deserves. Very little research on on-line teaching exists, despite widespread interest.

The promise of on-line teaching is that both teacher and learner can be anywhere, participating at any convenient time, through any type of microcomputer with modem. If on-line instruction can demonstrate economies of delivery of distance learning, it opens the door to ongoing learning for all potential learners. No one is too old or too young to be both learner and teacher. "Community networking" and "lifelong learning" are two related themes pointing the direction forward.

Currently this unprecedented new medium, based on interactive reading and writing, is invisible to the uninitiated. Many social and political barriers exist, despite major advances in the technologies.

The inevitable trend is that laptop microcomputers, within three to five years, will be standard equipment for all students and teachers. Costs should drop to below $500 for a laptop with word processing and telecommunications capabilities, at the very least. Laptops would allow students to communicate 24 hours day outside the classroom with each other, community members, librarians, and teachers (not to mention the rest of the world).

The age of PERSONAL COMMUNICATIONS SYSTEMS has come, and they will very soon be wireless, utilize multiple telecommunications mediums, and very possibly be wearable.

We need to teach students the knowledge access skills they can carry with them, literally, throughout life. If we train students on LAN-based terminals available only at school, will they have access to such equipment from home or once they graduate? Not likely, unless the LANs are accessible via dial-up from a homebased microcomputer!

Since January 1, 1988, Big Sky Telegraph has been continuously teaching teachers, via modem, a course on the basics of microcomputer telecommunications. The noncredit version of the course is available to all at no cost. All lessons are posted in the Class Files area on Big Sky Telegraph, 406-683-7680 (modem 1200b, higher speeds also available) or Telnet to bigsky.bigsky.dillon.mt.us. (Type bbs at login for self-registering access.) A printed class packet is available. E-mail requests to Frank Odasz, franko@bigsky.dillon.mt.us, or call voice-only 406-683-7870.

The ten lessons in this mastery learning self-paced course build both the skills and the important concepts associated with ongoing purposeful, affordable use of telecomputing, particularly for isolated rural teachers limited to the use of long distance phone calls. The key skills to learn are to capture text for off-line reading and to compose responses off-line for economical high-speed transfer, lasting only a few minutes per session. The tone of the course, and on-line interaction in general, is far more friendly and social than one might expect. Perhaps this is an example of a high-touch response to implementation of a high-tech innovation.

Once the course ends, students have at their fingertips everything they need to continue learning, interacting, and accessing resources on an ongoing basis. The course is actually a community-building device, linking teachers with a community of peers, resource persons, and limitless new educational possibilities.

With the experience gained from teaching this course for six years, the originators have created a new course dealing with the subtleties of successfully creating and teaching an on-line course. The pilot teaching of this new on-line course was completed during the summer of 1993.

"Distance Learning On-line: How to Create and Teach an On-line Course" resulted in 12 lessons and 450 messages from 12 students over a three-month period. Students learn to teach as they are taught, and they must reflect on their own subjective reactions to learning in a markedly different style of learning, different from anything most of us have ever experienced.

The students were practicing K-12 teachers, university faculty, and interested citizens. The class conference was echoed asynchronously on Big Sky Telegraph and multiple local bulletin board systems. Students participated in the course from home or school, through the following four connectivity models.

1. via direct Internet access
2. via long distance dial up access
3. via local dial up access to a local bulletin board

4. via autodial, automailer "point disks."

"Point disks" minimize the long distance costs and level of telecommunications skills required to participate. The potential is for a citizen to receive a disk in the mail preset for one or more on-line conferences and to insert the disk in his or her computer and hit a few keys to initiate an autopoll routine. The disk then automatically makes a long distance call, compresses all messages and files from one or more conferences, downloads the data to the student's PC, decompresses the data, and presents the messages in an easy-to-use message editor. The student then reads and writes off-line and repeats the process when finished writing.

School-based community bulletin board systems have the potential to remove the walls between K-12 education and the community. An increasing number of bulletin board systems can allow upgrading to full IP Internet access while retaining the BBS advantages of locally customized menus and conferences.

Six hours of TV per day is the national average for American citizens. Senator Bob Kerrey of Nebraska has stated that he believes SAT verbal scores would go up 50 points in a year or less for students who are on-line regularly, reading and writing electronically from home. I think he's correct and that students would find interaction far more enjoyable than passively watching television. Most people are surprised to find on-line interaction enjoyable and addictive.

Including parents and citizens in the on-line K-12 process can be an important part of making K-12 education relevant to community problems and issues. Considering the advantages— and I've only mentioned a few— our educational system will eventually justify laptops as a realistic lifelong component of education for ALL lifelong learners in our society. Loaner laptops from schools and libraries, in addition to public access computers, make perfect sense as a means to provide equitable access to learning for all Americans.

Local Bulletin Boards vs. Full Internet

For most schools and communities the choice is not between distributed bulletin board systems and full Internet access. Both serve different but related needs, and both are needed to fully empower communities.

The Role of Distributed Bulletin Board Systems

The Internet does NOT provide many of the advantages of a locally accessible electronic bulletin board. The ability to host local discussion conferences of all types, in a menu-driven system designed specifically for the local community, requires a local system. Self-teaching lessons, access to local resource persons and librarians, and showcase menus of high-value resources gleaned from the Internet and other sources to meet local needs, all become possible through a local bulletin board but are NOT available through simply providing access to the global Internet, or other national networks, such as Handsnet.

Bulletin board software has recently evolved to the point at which an increasing number of systems can allow upgrading to FULL INTERNET capabilities, while retaining the valuable local services and customized user-friendly menu-driven design.

It should be made very clear that distributed bulletin board systems are not advocated as a substitute for full Internet access, but rather are the most logical first step in the inevitable path toward full Internet access. They are "training-wheels" systems for the Internet that will continue to provide an important local support function even after full Internet access is achieved.

Each community needs to validate the benefits of BOTH local telecomputing and full Internet access without a great initial expense. Local bulletin boards provide an economical first step that MOST communities can easily take. Internet e-mail, Internet discussion conferences, and Internet high-value resources can all be made easily available via a local phone call on a local bulletin board system with distributed conferencing.

Those citizens who wish to sample full Internet access can do so at an hourly rate through dialup and/or SLIP connections, to identify how the local community might benefit from 24-hour full Internet access. Once a community can see how it might benefit from 24-hour full Internet access, its inhabitants can endure that considerable expense while still benefiting from the many other advantages of their own local customizable dialup network.

Advantages of On-line Instruction

There are very real, if subtle, advantages to on-line instruction, and significant differences from traditional classroom instruction, which become clear only through direct experience with this new instructional medium:

- On-line instruction can easily require twice the preparation and "in-class" effort as standard classroom instruction.

- Multiclassroom interaction can easily be added to the on-line classroom environment . . .with convenient global options.

- On-line interaction can easily be more intimate and individualized than face-to-face classroom instruction.

- Students can interact with each other, the instructor, and outside experts beyond the confines of a 50-minute class period, extending class interaction to potentially 24 hours a day, seven days a week, accessible from any microcomputer with a modem (home, library, workplace, etc.).

- Interactive writing is a decidedly more "mind-to-mind" form of communication compared to the more socially-oriented face-to-face form of interaction. The quality of interaction is notably higher than "off-the-cuff" comments.

- Students can compose their comments without the pressure of speaking "on the spot" in front of peers. The tendency is to be more succinct and thoughtful.

- A written transcript of all comments is available at all times for student catch-up or review.

- On-line learning lends itself to self-paced mastery learning with the support of mentors serving in a friendly learning-partnerships format.

- Once an on-line course is over, both teacher and learner typically continue to be on-line, and there is no real reason ever to formally end the potential for continued interaction and support.

- On-line instruction can give students the skills needed to meet their own lifelong learning needs and to be employable for information age vocations based on ongoing self-directed learning.

- Anyone, anywhere, anytime, can either teach or learn from anyone, anywhere, anytime, with economy.

In a literate society one might think the new dimensions for interactive reading and writing would be instantly embraced, but the evidence is that we're more a video, face-to-face culture than a literate one.

The Latin root of the word "literacy" refers to the ability to write. Purposeful interaction using the written word has not been a significant part of our culture at the individual level, and we're facing an infocultural reeducation as to how we define a truly literate individual.

The need to acquire new levels of literacy is emerging. Teleliteracy is the ability to understand the different connectivity models and applications of on-line, and hybrid forms of telecommunications.

"Infoliteracy" refers to the ability to handle and derive value from raw information. Information condenses to knowledge, which condenses to wisdom. In an age of information overload, we need increasingly refined methods of accessing "highest-value" information.

Barriers to On-line Teaching

The lack of teleliteracy among administrators perpetuates the myth that on-line instruction is always inferior to face-to-face instruction. For many types of instruction it is superior to the classroom in many important ways, as has been noted above.

Long distance phone calls are considered prohibitively expensive, despite the reality that high speed modems allow exchange of textual information at costs of less than one cent per page. Reading and writing do NOT need to be done during the long distance phone call but is BEST done off the phone. Text can be quickly captured for off-line reading, and responses should be composed off-line for quick transfer during a brief on-line phone call. Use of 800 numbers typically becomes prohibitively expensive as use grows unless the bulk of the reading and writing is done off-line!

Most universities do not honor on-line instruction as being equal to face-to-face instruction, and there are actually financial disincentives in place that discourage faculty from creating and teaching on-line. Most degrees allow only a few credits per degree of "nonresident" credits received via distance learning. This limitation has no relation to proven quality of instruction. Turf issues often inhibit widespread offering of on-line courses.

There has been no comparison of the economics and quality of on-line instruction to those of traditional classroom instruction. With the current educational budget woes, this lack of information reveals the predominant technophobic anti-literate biases against telecommunicated delivery of instruction based on interactive reading and writing.

Until more administrators experience on-line learning, the potential will continue to be invisible to them. The on-line medium presents unquestionably beneficial interactive components for traditional classroom instruction and all forms of distance learning courses. It does not compete with other forms of distance learning but powerfully complements all other forms by allowing an additional level of textual information transfer and interactive discussion.

Complementing Video Instruction

A videotaped, satellite, or fully interactive video course benefits from making textual supplements available to students and by allowing student submissions to be received nearly instantly by the instructor. Ongoing discussions building on the video presentations become conveniently available to all, beyond the limited time frame of the video presentation.

A radio educational broadcast can handle minimal interaction with callers. With the addition of an on-line component, everyone can share written comments broadly, building on the radio broadcast discussion. During the next broadcast excerpts from the on-line discussion serve as a catalyst for the next discussion.

Recent technological advances enhancing the connectivity models and speed of information transfer have made on-line instruction increasingly viable, and through the Internet the reach is global.

Teleliteracy of our leadership at all levels is a prerequisite to establishing the top-down support necessary for widespread use of on-line teaching. We're all in need of learning to become K-100 lifelong learners, and as previously mentioned, no one is too old, or too young, to be both a student and a teacher.

The "high-touch" opportunities of the on-line medium present opportunities for all of us to become actively involved in encouraging the motivation for learning of everyone in our communities. A new, warm, community-oriented type of ongoing education is what's at the heart of the rapidly growing awareness that "Community Learning Networks" is a concept whose time has come.

If you've never been on-line, please consider this a formal invitation. I think you'll be pleasantly surprised.

Paper

Identifying Predictors of Dropout from Distance Education

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Key words: distance education, locus of control, dropout, financial assistance, Rotter

Abstract

Research is needed to determine predictors of dropout from distance education since funding is often based on attendance. This study used Rotter's Locus of Control Scale and a series of demographic variables as data for a discriminate analysis. Financial assistance and locus of control were significant predictors of dropout. Qualitative analysis indicated lack of time-management skills and ill-defined educational goals as reasons for non-completion.

Introduction

Distance education, as an alternative to face-to-face instruction, has witnessed steady growth in higher education since its beginning in the mid-1800's. This growth is evidenced by the fact that in 1990 nearly 28 percent of all adult students in the United States were receiving education in some distance format. This influx of adults has occurred in part because of the proliferating demands of our technological society and in part because of the complexity of modern life. With the growth of distance education has, however, come the problem of exceedingly high attrition rates, which Carr and Ledwith (1988) found to exceed 30 percent.

A critical need exists for colleges to be able to predict with accuracy the potential persistence of distance education students, since the majority of governmental support is based on attendance. If the rate of completion could be enhanced through better counseling and student placement, subsequent fiscal budgets could become more stable. In an attempt to identify predictors of dropout from distance education, numerous studies have utilized a wide array of variables, including gender, age, and past distance education experience. This study investigated the predictability of two variables: locus of control and source of financial assistance.

Review of the Literature

In an attempt to base the findings of this research on a well-established theoretical model, the work of Tinto (1975) was used. Tinto hypothesized that student background characteristics coupled with demographic variables could be used as indicators of persistence. Tinto's (1975) model of dropout served as the theoretical framework for this research for several reasons. First, the model provided a widely accepted foundation from which to study dropout from distance education. The work of Kember (1989), Sweet (1986), and Bean (1980) supported this decision as well. Second, Tinto's model provided the structure needed to study the problem of high attrition among distance education students. Although other popular models such as Peters (1971) and Holmberg (1985) provide a framework, they lack focus to address the problem of dropout. Third, Tinto's model provided a framework for thinking about distance education dropout, for guiding administrative decisions about dropout, and for suggesting future research. Only Tinto's model could provide the wide structure needed for this study on distance education dropout.

From early research by Pavlov (1960) and Skinner (1968), it was learned that reinforcement acts to strengthen the recurrence of an action. Once an expectancy for the behavior-reinforcement sequence is established, the failure of the reinforcement to occur reduces the expectancy. Locus of control has been reviewed as an intermediary in this process (Rotter, 1966). The actual pattern of reinforcement influences the development of either internal or external locus of control. A person who is consistently reinforced for personal accomplishment will more likely possess an internal locus of control. A person with internal locus of control believes his or her own actions to be the cause of the reinforcement. Internals are, therefore, more cautious and calculating in their choices than externals and will continue to strive long after the externals have ceased to try. The person with an external locus of control sees events in his life as being manipulated by luck or fate. These students are less likely to persevere when faced with a challenge during their educational tenure.

Locus of control has been evidenced in a number of studies with traditional and distance education students (Dille & Mezack, 1991; Hashway, 1990; Rotter, 1966). An internal locus of control generates a personal belief that academic success is a result of one's own involvement with the course. Students with internal locus of control will remain on task long after externals because they believe they have the potential to succeed. Locus of control, therefore, cannot be overlooked as an essential variable in predicting dropout from distance education courses.

The second variable, financial assistance, is available to students in many forms. Some students receive help from parents, while others attend classes paid for through scholarships or loans. Still others are self-sufficient and pay the costs related to their studies themselves. In this research, financial assistance is important, for the results of numerous studies (Astin, 1991; Iwai & Churchill, 1982; Fields & Lemay, 1989) indicate that students who pay for their own college education complete more often than those who use scholarships or parental help. The results of research on students with loans indicates that these students complete more often than those with parental support but less often than those paying their own way (Astin, 1991).

Financial assistance in this study focused on four areas: parental support, scholarships and grants, student loans, and self-pay. Using each as an independent variable and then in combination in the final analysis, this study attempted to determine whether financial assistance could be identified as a predictor of completion.

Procedures

The sample for this research comprised approximately 100 distance education students and 75 traditional students registered for credit, Fall 1993, in English 101, English 102, or Sociology 101. Although both groups received the same instruction, the distance education students were taught in the following format: English 101 (computer conferencing), English 102 (correspondence), and Sociology 101 (audiocassettes). All 175 students were asked to complete Rotter's Locus of Control Scale and a demographic sheet that gave information on their source of financial assistance. No attempt was made to account for difference in teaching style, student achievement levels, handicaps, or motivation.

Experimental Design

Discriminant analysis was used to distinguish statistically between two groups of cases. These groups are defined in this research as completers and non-completers of the distance education courses. The traditional student group served as the control.

To distinguish between the groups, two discriminating variables were used to measure characteristics on which the groups were expected to differ. The variables for this study were source of financial assistance and locus of control. The mathematical objective of discriminant analysis is to weight and linearly combine the discriminant variables in some fashion so that the groups are forced to be as statistically distinct as possible. By combining several characteristics of the student, such as locus of control and financial assistance, this statistical analysis attempts to identify a single dimension on which completers are clustered at one end of the spectrum and non-completers at the other.

In addition to the statistical analysis presented above, qualitative analysis was utilized to expand the scope of understanding. A telephone interview with non-completers was conducted to determine verbally the reasons for their dropout. Interviews were scripted and analyzed to determine trends in attrition. Data collection through interviews allowed the researcher to go beyond mathematical calculations to determine predictors of dropout. While quantitative methods extract and interpolate information on variables selected prior to the data collection, qualitative methods allowed for the emergence of numerous variables during the study. Interviewing not only supplemented discriminant analysis by giving the researcher a more complete picture of dropout but also deleted restrictions imposed by investigation of only the two variables previously identified. Interviewing students who did not complete was appropriate for this study for two reasons. First, a review of the literature indicates that the interview is widely used and accepted as a viable method for data collection. One such study is that of Kember (1989) whose longitudinal study attempted to identify a model of dropout from distance education. Although interviews were only one of his data collection techniques, Kember stated that interviews are essential since the reasons for dropout are ever-changing. Only the interview can reach the personal reasons for non-completion.

Results

"Locus of control" as a single, independent variable was able to predict dropout with an accuracy of 80 percent. This finding corresponds to research conducted by Rotter (1989) that found locus of control to have a direct bearing on students' completion of coursework. Rotter reported, for example, that students with internal locus of control were more focused on their educational goals than those with external locus of control. Internally controlled students worked to overcome outside pressures and, therefore, exemplified higher rates of completion. Dille and Mezack's (1991) work with community college students also supports the finding of the present study. Dille and Mezack reported that 72 percent of the students who scored as internals completed the course.

The interviews also added credence to the predictive ability of the variable locus of control. Students who did not complete gave rationales based on external causes. For example, the blame for non-completion was placed on family members, employment, and even the computer equipment. It may be speculated that the students with external locus of control did not assume the personal responsibility for their own educational success. Instead, they allowed external pressure to control their decision to drop. This conclusion is supported by the work of Altmann and Arambasich (1982), who found that family and job responsibilities were often given as the causes for non-completion. From their interviews with students, Altmann and Arambasich reported that students with external locus of control did not see themselves or their lack of internal motivation as the cause of their non-completion.

Analysis using the variable "Source of Financial Assistance" revealed a questionable yet significant association between students who were self-paying and the completion of distance education courses. The contingency coefficient of .589 allowed this variable to be analyzed further as a possible predictor of dropout in the discriminant analysis. The results of the discriminant analysis showed that self-pay as a component of financial assistance was able to predict 55 percent of the dropouts in this study correctly. Although this is only slightly above the level of chance, this finding supports the work of Fields and Lemay (1989) and Kronquist (1983), who found source of financial assistance to have little or no correlation with completion.

Although this variable alone offered little help in predicting dropout, when source of financial assistance was recorded and combined with locus of control, the two in combination were able to predict nearly 85 percent of the dropout (See Table 1). Results obtained from the discriminant analysis on both locus of control and self-pay allowed speculation that internally motivated students who were paying their own tuition had the best chance of completing their distance education courses. Interviews with non-completers support this conclusion. Those who were self-paying indicated a concern about forfeiture of their tuition resulting from their decision to drop the course.

Table 1

Discriminant Analysis with Distance Education Sample

	Actual Group Predicted Membership	Group Membership
Drop	84.4%	15.6%
Complete	15.0%	85.0%

Percent of cases correctly classified: 84.78%

A review of the interview scripts for external, self-paying students, clearly shows that the outside pressures of job and family took precedence over the loss of the tuition. These students tended to allow outside pressures to determine their educational decisions. In this case their decision was to drop the course. Students who had parental support, however, did not indicate the same concern over the financial loss. This again could be related to the external locus of control. It can be speculated that these students may not have assumed personal and financial responsibility for their own education.

This research has resulted in two significant variables with which to predict dropout from distance education: locus of control and self-pay as a source of financial assistance. A great deal is already known about the problems and needs of the distance education student: the number of adults engaged in this form of education runs into the millions worldwide. As more and more institutions of higher education expand to include the distance education format, information is needed to support the distant learner and, thus, reduce the high rate of non-completion. Support for the distance education students can come only from carefully designed programs that include student-instructor interaction, screening for locus of control and source of financial assistance, time management seminars, and instructors that understand the important differences between traditional and distance education formats.

Attrition cannot be attributed to one cause but must be considered as coming from a combination of factors. This study identified important predictors of non-completion. The findings may prove to be of value for future researchers and instructors who are involved in the future of distance education.

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Demonstration
Mosaic: Methods beneath the Magic

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Abstract

By the end of the session, the attendees: will be familiar with some of Mosaic's uses in the World Wide Web, will have become aware of both kudos and caveats related to Mosaic's use, will have been exposed to the concept of a markup language, will have observed, and participated in, the steps in the creation and modification of a few simple Mosaic pages using html (HyperText Markup Language), will have seen examples of and will have been made aware of some uses for Mosaic imagemaps and forms.

State Networks
Bringing the World to the Classroom: A California Solution

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Key words: CalTIP, California, telecommunications, telecomputing, technology, resources

Abstract

In this session, participants will see the Graphical Interface for Network Access (GINA) used to access the California State University Network (CSUNet) and the California On-line Resources for Education (CORE), a gateway to the Internet. In addition, the California Technology Information Project (CalTIP), a vision for a nationwide network of technology-based resources, will be shared. Handouts will be provided.

A visual presentation will be made using Aldus Persuasion 2.1, a Macintosh, an overhead projector and an LCD panel. In this session, a brief background of telecomputing, the step-by-step log-on sequence using the new Graphical Interface for Network Access (GINA) as the communications software, will be demonstrated. California On-line Resources for Education (CORE), an on-line service provided free to California educators, will be shown. CORE is cosponsored by the California State University system, the California Department of Education (CDE), and the California Technology Project (CTP).

CORE will be demonstrated as a gateway to the Internet to gain access to valuable services such as ERIC, the NASA Space Center, electronic mail with access to the world, computer conferencing, bulletin boards, databases, and much more.

The California Technology Information Project (CalTIP) will also be shared with participants. This project is part of a vision for a nationwide network of technology-based resources. It is envisioned that every state will have similar resource all connected in a network that will be easily accessible to students, educators, and parents. Handouts will be provided that include the above presentations and the step-by-step log-on process to CSUNet.

CalTIP: California Technology Information Project, technology-based materials, packaged self-contained projects and programs, staff development resources, curriculum and assessment resources, printed materials, technology hardware, program evaluation resources, demonstration resources, telecommunications resources, and funding resources

CNN News lesson plans are available on-line with CORE each day and can be used with the daily cable TV broadcast called CNN Newsroom.

Internet Access using the Graphical Interface for Network Access (GINA) directly to such services as: ERIC, Cleveland Freenet, Melvyl, NASA's SpaceLink, Weather Service, and Dartmouth College Library.

Paper
The Use of Computer-Mediated Communication in Graduate Instructional Technology

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Key words: electronic-mail, computer-mediated communication, telecommunications, instructional technology, survey, questionnaire

Abstract

The current research is a replication study of Grabowski, Pusch, and Pusch's (1990) investigation. A survey consisting of 91 questions was completed by graduate students. The purpose of the survey was to "develop a profile of most likely users, to identify those factors which may influence or inhibit its use, and determine its perceived social and intellectual value in a graduate school community" (Grabowski et al., 1990, p.276).

Background

As the 21st century approaches, innovative educational models that utilize new technology will evolve. One potential tool for a new model of education is computer-mediated communication (CMC). Collis, Veen, and De Vries (1993, p.17) relate that CMC skills will be the required computer literacy skills in the future. Therefore, research on CMC and the use of CMC is needed to build a theoretical knowledge base.

CMC is composed of both asynchronous electronic-mail messages (e-mail) and on-line group conferencing (Davie, 1988, p. 57). Quinn, Mehan, Levin, and Black (1983, p.205) define electronic-mail as "modeled on letters and memos typed or written on paper." However, e-mail messages are sent and received via the electronic highways within a short period of time.

Computer conferencing is defined by Harasim (1987, p.121) as "a group communications medium enabling groups of people to exchange ideas and opinions and to share information and resources" via the electronic highways. Individuals who use CMC have the ability to asynchronously read or post an article to a conference with an entire group as the target audience. Throughout this paper CMC will be used as a term to embrace both electronic mail and on-line conferencing.

The current investigation is a replication of the Grabowski, Pusch, and Pusch report (1990) which examines the characteristics of electronic mail users, the reasons for or against use, and the perceived social and intellectual value of e-mail. The purpose of this current research is to continue addressing these issues with a graduate instructional design/technology population.

Advantages of CMC

The effectiveness of on-line education through CMC has been demonstrated by both quantitative and qualitative research, as well as by descriptive articles and workshop/conference presentations

(Collis, 1993; Copen and Gragert, 1993; Gast, Ounsworth, Lewis, and Davey, 1992; Honey, 1993; Rogers, 1989; and Swanson and Laughon, 1993).

A synthesis of that CMC research in classes that are fully on-line as well as those that include CMC in a traditionally taught (face-to-face or FTF) setting follows. Particular attention is paid to that which is unique about the electronic medium.

As a result of a four-year study of on-line CMC educational strategies, Hiltz (1986, p. 95) concluded that "(o)ur initial findings in a long-term investigation of computer education at the post-secondary level suggest that the medium can be effective." However, Hiltz (1986, p. 103) also concluded that on-line education is not for everyone and predicted an expected "20 percent or more" dropout rate for electronic learning.

An additional goal of the present research was to continue looking at strategies for on-line instruction. One such strategy (Hiltz, 1986, p. 104) is to create "new learning and teaching environments that are more effective and exciting for at least some kinds of materials, rather than merely trying to replicate the traditional classroom electronically."

And there are concerns which need to be considered: students reported an average of 2.4 hours to learn the required basic on-line computer skills, and an average of 5.1 hours was required to feel comfortable with the on-line system. Therefore, one to two weeks with support by the instructor to learn necessary computer skills was recommended.

Harasim (1987) related that on-line conference participation does not just automatically happen. Instead, the curriculum designer must plan for and facilitate student interaction through a "learner-centered, group learning approach" (Harasim 1987, p. 132).

A case study of two distance-education courses was reported by Davie (1988), in which students were required to participate in on-line conferences and complete on-line group projects. Davey concluded that the "instructor's impression was that these students accomplished at least as much as graduate students in similar courses conducted face-to-face"; papers written collaboratively via the on-line process were judged superior to individually written papers; and "the quality of the writing was superior to small group efforts working face-to-face" (p. 65). In addition, students' attitudes and satisfaction with the courses were gauged to be "high" by the author from student responses to a Likert-type questionnaire.

Schrum (1992) reported that an on-line graduate course for educators was an effective, electronic classroom; and immediate feedback was a unique advantage. Three negative comments, identified as student "concerns," are high cost of computer time, lack of support for the implementation of telecommunications in education, and insufficient technical support.

Main and Berry (1993) conducted a semester-long study comparing traditional and on-line methods. Students who were randomly assigned to the on-line sections received higher grades than students in the equivalent FTF sections. And the on-line students rated the instructor higher than students in the FTF section taught by the same instructor did.

Several differences between an on-line group and an FTF group were discovered by Quinn et al. (1983). For the on-line group, messages posted by both the professor and the students were available to be reread as needed whereas the spoken word was non permanent. E-mail responses averaged 106 words, versus 12 words for the FTF group. As a result, the amount of time to cover a question was longer for e-mail, 3 to 6 days, versus 90 minutes for the FTF group. A different pattern of communication was discovered. In the traditional FTF group the pattern was initiation by professor, response by a student, and evaluation by professor; the pattern observed on-line was initiation by professor, multiple responses by students, and evaluation by students rather than professor.

Turoff and Hiltz (1986) discussed survey results from two upper-division management classes offered by the New Jersey Institute of Technology. Lectures were presented to each class in the traditional FTF method, with discussion conducted via computer-conference. In addition, assignments such as reviews of professional articles were posted to the computer-conference, allowing students to read each other's written assignment.

While most of the students indicated that they would like to continue participating in on-line education, one-third of the students indicated that they would not want either to take a course entirely on-line or to participate in a course augmented with an on-line conference. The negative response appeared "to correlate with facts such as poor typing skills, a preference for expressing views verbally or a lack of writing skill" (Turoff and Hiltz, 1986, p. 10).

Turoff and Hiltz (1986) found that two-thirds of the students who chose to participate in an electronic classroom or have a computer conference augment a course viewed on-line educational strategies as "advanced state of the art" (1986, p. 10). The positive responses correlated with the following communication variables: "exchange of comments, reviews and assignments with other students, easy access to the instructor, feeling of being more involved and more interaction" (Turoff and Hiltz, 1986, p. 10).

D'Souza (1991, p. 106) conducted an "exploratory study which examined the used of e-mail as an instructional support tool in the learning process." The research subjects were undergraduate students enrolled in the School of Business who had previously had at least two computer classes. "Class information and assignments" were distributed "via electronic mail" (D'Souza, 1991, p. 106). In addition, the experimental subjects were required to send an e-mail message to the instructor once a week.

The experimental subjects scored significantly better than the control subjects on four dependent variables: written assignments, course exams, group project, and final exam. D'Souza (1991, p. 109) concluded: "The findings suggest that e-mail is a viable communications and dissemination support tool in educational settings."

In a study designed to investigate processes to increase student participation in computer science classes through the use of e-mail and an on-line conference, Saiedian (1992-93) discovered that the implementation of CMC can improve critical thinking skills.

Grabowski, Pusch, and Pusch Study

As graduate students in Instructional Technology, we are particularly interested in defining those characteristics of the computer-mediated communication user and studying possible relationships between them. To do so, we chose to replicate the original Grabowski, Pusch, and Pusch study (1991) as closely as possible. The differences that were encountered in the replication attempt are explained as the procedures are noted and again summarized in a final section.

The original study investigated the following four questions:

1. Who is most likely to use electronic mail, and for what purpose?
2. What factors influence or inhibit its use?
3. What is the perceived social and intellectual value from its use?
4. What are the factors that influence level of use?"

To answer these questions, we studied a graduate school community of Instructional Technology program majors. Within the IT program, electronic mail use is encouraged and even required for some courses. Surveys were dispatched to 104 members of the program, either by mail or during class. To achieve the desired sample size, a follow-up mailing was used to yield a total of 68 answered questionnaires (65%).

Using the four questions (shown above), the data were organized thus: demographic data to profile those who use e-mail and those who do not; purpose and distribution of messages; factors that contributed or inhibited use for both users and non-users; and perceived intellectual and social values comparing whether the results of this group matched those which had been suggested in the literature. Finally, each of these areas (demographics, messages, factors, attitudes) was analyzed across four levels of use to determine if a relationship existed between use and response. We employed the original Grabowski categorizations of user level of *light* (less than one hour per week), *moderate* (one to two hours per week), *daily* (three to five hours per week) and *heavy* (more than five hours per week with but one exception: we extended the moderate limit to two and a half hours per week and began the daily limit at two and a half hours to account for the period that was not addressed in the original study.

The survey instrument was not identical to the one used in the original study. Grabowski was kind enough to provide a refined questionnaire. The differences between the original and this newer version are noted in the following table.

Results

Who uses E-mail?

The first question was addressed by a comparison of the demographic data within Table 1.

Table 1: Demographic distribution by percentage of (a) sample (b) e-mail users (c) e-mail non-users

* Significance at .05 level

Demographics		a) Total	b) Users	c) Non-Users
Age	20-30	18	83	17
	30-40	34	87	3
	40+	44	83	17
	Unclassified	4	100	0
Gender	Female	62	83	17
	Male	38	89	11
Children	Yes	34	87	13
	No	66	84	16
Length in	> 1 year66	91	9	
Program	≤ 1 year	34	74 *	26
Status	Full-time	60	90	10
	Part-time	40	77	23
Assistantship	Yes	23	93	7
	No	77	82	8
Job	Full time	37	80	20
	Part time/consul	26	89	11
	None	37	88	12
Location	Non-commuting	94	83	17
	Commuting	6	100	0
E-mail Acct.	Yes	74	90 *	10
	No	26	72	28
Use e-mail	Yes	85		
	No	15		
Length	< 1 year	45		
using	1-2 years	31		
e-mail	>2 years	24		

Our study made no comparison of international students with nationals, nor did it break down the level of graduate work into master's and doctoral categories. The newer instrument did not evaluate these factors. We chose to evaluate significance of sample differences with a contingency coefficient for most of these relationships (use of e-mail or not, by a particular demographic factor) as much of the data were nominal. We found less relationship than the original study; the only variables which proved significant at the .05 level were length in the graduate program and possession of an e-mail account.

The Grabowski study made guarded reference to age as a possible factor in determining level of use. However, its conclusion that older students tended to use e-mail less often than younger ones was not significant with our figures. Eighty-seven percent of those 30 to 40 years old were users; 83 percent of both the 40 + age group and the 20-to 30-age group also report use.

The Grabowski study pointed out that the students who would best be served by e-mail (the commuters, those with children at home, part-time students) did not take advantage of the medium and become regular e-mail users. Our study showed that commuters were using e-mail, as did students with children at home. Both did so at a higher level (but not significantly so) than did their counterparts. Part-time students, however still failed to use e-mail as much as the full-time students.

To Whom and for What Purpose?

Table 2 addresses the first part of this question. Students who used e-mail were asked to choose from five intradepartmental categories and five interdepartmental categories regarding the people with whom they corresponded. The responses closely paralleled those of the Grabowski study (our local bulletin board was substituted for that which existed in the original study).

Table 2: E-mail recipient by percent selected and level of use

Message Sent to:	Percent selected	Contingency	p Coefficient
Inside Department:			
1. Fellow students	66	0.32023	0.09375
2. Friends	54	0.276	0.18844
3. Advisor	43	0.16395	0.67149
4. Faculty	60	0.26977	0.21464
5. Computer conference	22	0.30827	0.11232
Outside Department			
1. Friends	63	0.27497	0.20524
2. Fellow students	27	0.17388	0.63365
3. Advisor	7	0.19509	0.52886
4. Professional within TeachNet	21	0.1839	0.57343
5. Professional outside Teachnet	38	0.16678	0.65241

Table 3 shows the results of the second part of the above question: for what purpose do you use e-mail? Respondents could choose from twelve different possible reasons and were invited to include other purposes on the list. Similar patterns between the original study and our replication exist. However, a larger percentage of students in the replication study indicated that e-mail was employed to alleviate boredom and initiate friendships.

Table 3: Purpose of e-mail use by level of use

For What Purpose:	Percent Selected	Contingency	p Coefficient
Initiate friendships	24	0.1929	0.52382
Exchange social information	47	0.14326	0.74932
Discuss ideas	72	0.19873	0.49648
Send in assignments	44	0.07634	0.95234
Course advisement	24	0.19404	0.51846
Save trips to campus	38	0.13445	0.78486
Class discussion	52	0.02544	0.99809
Alleviate boredom	24	0.2461	0.29105
Help on assignments	41	0.17999	0.58455
Avoid face-to-face	10	0.21775	0.40938
Course scheduling information	19	0.20643	0.46073
Transmit data files	49	0.226	0.37322

One interesting difference between the two studies was that the original study found significant correlation between level of use and the variables explored on no less than six factors. The replication study showed no such correlation.

Factors That Encourage or Inhibit Use

Respondents were asked to choose which factors encouraged e-mail use (Table 4) and those which inhibited (Table 5) by checking any of ten categories. The option of "other" was also provided. No time or place limits (51% and 56%), easy access to computers (56%), and computer knowledge (53%) were factors which students who used e-mail noted. Academic need (46%) was a much higher concern than social need (22%).

Table 4: Factors that encourage E-mail use

Factor	Percent Selected	Contingency	p Coefficient
No place limit	56	0.50507	0.70456
Easy access	56	0.56836	0.27393
Knowledge of computers	53	0.57706	0.36299
No time limit	51	0.5701	0.26313
Academic need	46	0.60182	0.32532
Like to try new things	43	0.41787	0.97669
No cost	40	0.55326	0.54169
Ease of use	37	0.54973	0.39935
Required	31	0.46689	0.88193
Social need	22	0.49293	0.77215

Those students who were non-users chose from eight items that were later grouped into four categories: no need, inconvenient, no technical skills, socially inappropriate. Need (50%) and convenience (40%) were the major factors reported for lack of e-mail use.

Table 5: Factors that have inhibited use by percentage selected

Factor	Percent Selected	Type	Clustered Factors	
No need	50	N	Need	50
Cost	20	C	Convenience	40
No time	20	C	Technical skills	20
Lack of knowledge	10	T	Social perception	0
No computer access	10	C		
Inadequate nature of training	10	T		
No modem	10	C		
	N=10			

Note: Respondents could select more than one factor and the responses were then clustered into four types.

The Grabowski study noted similar patterns concerning the encouraging factors. While "no need" was the most frequently cited inhibiting factor by both the original and the replication studies (40% and 50%), our study noted that lack of convenience (40%) was a major hindrance, in marked contrast to Grabowski (23%). Social issues were minor concerns in both studies.

Perceived Social and Intellectual Value

Sixty-four Likert-type questions were asked of all respondents concerning their perceptions of the social and intellectual value of e-mail. These questions were then divided into six categories addressing the following: e-mail as a unique mode of expression, as a technology for bringing people together, as a social tool, as an information source, as a professional tool, and as an overall benefit. Our data (Table 6) suggested that e-mail offered professional value (mean = 3.73/5) and social value (3.71) in roughly equal doses. As an information source, e-mail also was perceived as having worth (3.55). E-mail was also hailed by our respondents (3.42) as a convenient way of bringing people together, as well as a unique method of communication (3.42). The overall benefit of e-mail was reported (3.73) by the group.

The Grabowski report noticed a marked variation between professional (4.02) and social (2.75 and 3.02) value; our data suggest otherwise.

Table 6: Perceived value by level of use

Group	Spearman R	Significance
1. Mode of expression	-.05387	.69885
2. Means for connecting people	.08384	.54281
3. Social contact	.04305	.75955
4. Information source	.10583	.43759
5. Overall value for professional life	.11587	.39957
6. Overall benefit	.17933	.18602

Factors That Influence Level of Use

To determine which, if any, factors, contribute to e-mail use, demographics, perception, encouraging factors, and purpose were correlated with the level of use. The methods which we employed were substantially different from those used in the original data, partly in response to the newer measuring instrument and also the form that the data took.

The demographic data were in one of two forms: either ordinal (age and length of time in program) or nominal (gender, status, etc.). Using the contingency coefficient, a non-parametric procedure closely related to chi-square, we analyzed all nominal data for correlation to level of use. No (.05) correlations were discovered. Our ordinal data underwent analysis with the Spearman rank correlation technique. Here, the only significant relationship was between level of use and length of time in the graduate program. Those users of e-mail who had been in the program for longer periods tended to be heavier users of e-mail.

Contingency coefficients were also run on the destination to which messages were sent (Table 2) and on the reasons messages were sent (Table 3). No significant correlations were found with respect to level of use. Slight correlation (at the .1 level) was demonstrated by those who reported contact with their fellow students. The factors that encourage e-mail use (Table 4) underwent analysis in the same manner. Again, no significant correlation with regard to level of use was discovered. Finally, level of use was correlated to our Likert-means through a Spearman rank method. No significant values were noted.

Grabowski's study showed an interesting relationship between social contact and level of use that did not show up with our current study.

Both studies found that all users, regar .ess of level of use, found that the overall benefit of e-mail was worth the effort.

Differences between the Studies

The intent in undertaking this study was to replicate as closely as possible the Grabowski, Pusch, and Pusch project. Our study did not reveal the multiple correlations between user level and each of several variables that were discovered in the original research. The differences encountered might be explained by slight variations in the populations. Maturation in the medium (e-mail use has increased dramatically in the past three years) might provoke a shift in certain relationships. And for a variety of reasons we chose to employ a different statistical procedure, which may have affected the results.

Also, all of the original studies were administered through a mail/at home completion whereas our replication also included administration during scheduled classtime. Furthermore, the section of perceived social and intellectual value involved a grouping of many questions into six subcategories (see Table 6). We undertook this grouping without reference to the original study (a product of the newer questionnaire), which may affect correlations. Finally, controlling the replication environment proved more difficult than we had originally envisioned. Reproducing every factor of the original study was beyond our capabilities.

Conclusions

Despite the differences, our replication validated several of the relationships as in the original study. Large numbers of students indicated that e-mail offers substantial professional/academic benefits; even light users recognized its importance. The social benefits of e-mail were also recognized by users of all levels. Inter- and intradepartmental friendships flourish through this electronic medium. But the essence of the medium, the uniqueness of e-mail as a mode of expression, shows slight negative correlation with the level of use. Is it possible that the "dream" of e-mail, its McLuhanistic beam-me-up gee-whiz essence, has finally given way to the practical benefits that it truly offers?

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Panel
Computer-Mediated Communications and Ethics: Responsible Telecomputing

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Abstract

Within the past decade, we have seen an exponential increase in the use of computer-mediated communications (CMC) in public schools. This new technology provides an unprecedented opportunity for students and teachers to access vast information resources, communicate with experts in many fields and work on collaborative intellectual projects with others across the globe. It also poses new challenges to educators in understanding the ethical and legal issues related to the use of CMC and in helping to prepare students to become responsible users of these new technological tools and information resources.

Law enforcement officials have noted an alarming trend in which young people start by hacking into systems and eventually become serious offenders with computers. They note that these offenders adhere to their own ethical standards and hold unconventional beliefs about computers and information. Some of their basic tenets are:

- *Data are free and should be accessible to anyone.*
- *Data should never be destroyed but there is nothing wrong with viewing and transferring data for one's own use.*
- *High school students who place viruses into computer systems are innocent pranksters and do little harm.*
- *Hackers who break into computer systems should be respected because they test the soundness of the system and reveal holes and weaknesses.*
- *If someone does break into a system, the school or corporation is at fault for failing to safeguard its computer files adequately.*

Contributing to this problem, is the lack of awareness of these issues by many educators and the lack of information and materials to assist teachers and students in understanding the ethics of use of the new telecommunications technologies.

This panel brings together a group of experts concerned with the ethical use of the new information and communications technologies. The panelists will discuss current legal and ethical problems and issues related to the use of computer-mediated communications, including confidentiality and privacy, evolving on-line documents, plagiarism and giving credit, concepts of electronically stored information and multimedia as property, telecommunications courtesy ("netiquette"), free speech vs. school responsibility, etc.

The panel will also discuss the lack of integration of information ethics into the elementary, secondary, and higher education curriculum. It discusses what, when, and how ethical issues related to the use of CMC should be taught and the need for research on effective strategies for the teaching of information ethics at the elementary, secondary, and postsecondary levels. The panel will also offer recommendations for ways in which educators can help students develop ethical and responsible use of telecommunications in education.

Panel

Project Circle: The Use of Telecommunications to Support Teachers as Change Agents in Implementing Computer-Supported Collaborative Learning Environments

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Abstract

Project CIRCLE (Collaborative Information Resources/Computer-supported Learning Environments), funded by the U.S. Department of Education Secretary's Fund for Innovation in Education, uses telecommunications as a means of communication and support for high school teachers and student mentors in implementing new computer-supported collaborative learning environments in an inner city and a suburban high school. The project involves the collaboration of the two high schools, a research university and the private sector, community and other organizations. The participating high schools and the university are infusing new collaborative knowledge-building, writing, decision-making, and research software tools into the curriculum based on constructivist views of the learning process. Through the use of TeachNet, a wide area network established at the University of Texas at Austin, teachers, students, college faculty, and graduate students share ideas and problems, access information, training

resources, and on-line experts related to the project, hold synchronous conferences, and engage in cross-school instructional and research projects.

High school students selected as mentors play an important role in assisting teachers in planning and conducting technology-based collaborative learning activities on the school networks and in the use of telecommunications resources. The student mentors have established their own bulletin boards and forums on TeachNet to support their activities.

Students are also doing collaborative writing using Daedalus. The computer-mediated communications environment enables students to brainstorm ideas, respond to problems generated by the teacher or other students, and comment and follow threads of discussion on-line. One high school is implementing TeamFocus, a network-based decision-support software environment for identifying problems, generating hypotheses, prioritizing and building consensus on possible solutions. This is the first application of this corporate decision-making computer-based environment to high school curriculum.

The Project CIRCLE panel will address the strategies, processes, advantages, limitations, and benefits of:

- *the use of telecommunications as a support system for teachers as change agents within the school*
- *the use of network-based collaborative writing, decision-making tools by students*
- *the use of on-line mentors to build expertise and knowledge of students*

Math/Science
Live From. . .Other Worlds: A Pilot Electronic Field Trip

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Abstract

"The worst thing that has happened to science education is that the great fun has gone out of it. . ." wrote researcher and essayist Lewis Thomas in 1981. Instead, properly understood, science is "high adventure. . . the wildest of all explorations ever taken by human beings, the chance to catch close views of things never seen before, the shrewdest maneuver for discovering how the world works" (Thomas, 1981). Science should be high adventure, and technology might be instrumental in providing students new forms of travel.

Last year students across the United States went on a very unusual field trip to one of the iciest, coldest, windiest and most remote place on Earth. They did not have to weather the summer temperatures of -40° F, struggle through blizzards, or use half their caloric intake just to maintain their body temperature. They traveled in relative comfort by way of satellite and computer networking to Antarctica.

Live from. . . Other Worlds was an integrated multimedia project that took students on an electronic field trip with a team of researchers to Antarctica. It included a set of classroom materials to prepare for the journey, computer links between students and the scientist accessible directly over PBS Learning Link and NASA Spacelink, and on the Internet via NASA's K-12 NREN Initiative and three forty-minute television programs. It connected students participating live on-camera in Hawaii, Virginia, and at NASA's Ames Research Center in California with researchers over and under the Antarctic sea-ice near McMurdo Station —more than 10,000 kilometers (6,000 miles) away. Its explicit focus was a NASA Telepresence Project researching robotic control techniques in preparation for future planetary missions and, as part of the NASA/NSF Antarctic Space Analog Program, surveying the underwater environment of McMurdo Sound at depths never before explored by humans. Its implicit message was the excitement of research on the frontiers of discovery and the personal satisfaction in their careers felt by young scientists like robotics team leader Carol Stoker and diver Dale Andersen —role models for students participating in the project by viewing the programs over television or by going on-line over computer networks.

Formative analysis throughout the process of this pilot project provided a systematic approach to developing and identifying educational needs, specifying program goals, identifying strengths and potential uses of different media, and suggesting a range of instructional strategies to capitalize on the power of different but complementary components of the project.

The pilot provides three opportunities for student and teacher participation:

1. *hands-on classroom activities*
2. *on-line connections to researchers in the Antarctic and other resources*
3. *three live video programs, distributed free over public television, and also available on videotape*

Classroom Activities: The Teacher's Guide and Associated Print Materials

A comprehensive teacher's guide was researched, developed, and printed by the project team, with the assistance of the NASA "Mission from Planet Earth" Study Office. The guide provided background information and suggested hands-on classroom activities and other educational resources to prepare students for their upcoming field trip. The guide included descriptions of the climate, terrain, animal and plant life of the Antarctic. There were activities to stimulate students for a better understanding of how robots can help humans explore remote areas such as the ocean floor and how experience with this technology prepares for future exploration of other planets, such as Mars. One such class project, involving teams of six students, blindfolds, broom handles, and a floor-grid, was called "Build a Robot Out of Humans." The wrap-up activity involved exploring, mapping, and describing an environment in which an alien life-form might be found. This final exercise also served as a kind of embedded assessment of student learning from all components of the pilot.

The guides were bundled with four existing NASA publications on robotics, Mars, and planetary exploration and mailed directly to schools. The hands-on activities were developed by a team of science educators, with the collaboration of the SETI Institute and the Planetary Society, and reviewed for practicality and intelligibility by classroom teachers.

In addition to science curriculum, extensive first-person biographies of participating researchers were included, including anecdotes and personal information. These materials were designed to help students understand how early curiosity about their world can lead to a satisfying career in science. Teachers were also provided with simple suggestions —and some encouragement —about how to participate on-line. These materials were mailed to 2,500 teachers by the NASA Ames Education Division.

On-line Computer Resources: Databases and Interactive Materials

On-line, teachers and students were able to use computer and modem to look over the scientists' shoulders from the very beginning of their flight to Antarctica right up to their departure for the United States by reading two field journals, "The Telepresence Project Research Log" and "Dale's Dive Diary." These regularly updated reports from team leader Carol Stoker and diver Dale Andersen provided rich descriptions of what the researchers saw, felt, thought, and learned as they worked hard to solve the everyday problems of doing science in one of the most remote and difficult areas of the world. These reports gave students information about the daily life of an Antarctic researcher, providing intriguing details about safety precautions that needed to be taken while working over and under the sea-ice, and even personal anecdotes about the kind of food eaten for Thanksgiving at McMurdo Station. "Dale's Dive Diary" described the trick of putting hot water in his gloves to ease the difficulty in working with equipment under water and how a concrete casing left on the ocean floor in 1961 could help ocean-bed ecologists study the rate of colonization and growth of marine organisms such as the soft coral Alcionium. Dale also described the human aspects of working with a team of scientists, engineers, pilots, and other essential support staff under dangerous and extreme conditions.

Several teachers used these reports as models for student journals about their own local project activities, combining language and science skills. By following the scientists' daily activities, students were encouraged to think about scientific knowledge and investigation as "lived experience" rather than dry facts from the past to be mastered.

Through an on-line feature titled "Researcher Q&A," scientists in Antarctica and elsewhere were available to respond to questions from youngsters and teachers. Both questions and answers were then posted on-line for open access. Students could read questions sent by other students and the researchers' responses and then could follow-up with their own inquiries or comments.

The three participating computer networks made the teacher's guide available on-line in both English and Spanish ("En Vivo de. . . Los Otros Mundos") as well as providing an on-line library of general-interest files and popular articles. These included information on robotics, Antarctica and Mars, and a magazine piece written by then-senator Al Gore about his own experiences on "the Ice."

Live Television And Videotape: "Tele-presence" at Remote Sites

Students who "accompanied" the scientists to Antarctica on-line, reading the field journals were eager to meet Dale and join him, via satellite and telecommunications, during one of his dives. They already knew Dale from his messages and had heard about his diving partners, Kathy and Jim, and technicians Roxanne and Don, who monitored the Telepresence Remotely Operated Vehicle from a fish-hut out on the sea-ice. Via television, and without having to put on dive suits or worry about freezing fingers, students were, in fact, able to follow Dale under the ice and deep into the sea through three forty-minute video programs.

Students were able to ask questions about sea-stars and dive depths, the effects of the ozone hole and temperatures on marine organisms, directly to Dale as he swam 100 feet down in the Antarctic Ocean. In addition, students on-camera at Ames in California, and in Hawaii and Virginia, were themselves able to control the underwater robot, nicknamed "Mars One." At Ames, students worked with sophisticated Silicon Graphics workstations, but at the other two sites they used regular school computers connected via ordinary modems. During the third program, students in Hawaii and Virginia were able to drive a wheeled robotic test vehicle in a simulated planetary environment at NASA Ames in California. Students' faces showed their amazement, exhilaration and pride at being able to type on their keyboards and see, after a short time-delay, the robots far away in Antarctica or California move and turn. As a symbol of the global connectivity now possible through on-line networks, it brought the "information superhighway" powerfully to life for teachers and students participating or viewing.

This experience also gave reality and visual substance to the word pictures formed earlier from reading Dale's underwater descriptions and Carol's research log. Students all across North America were now on an electronic field trip to one of the most remote places on Earth with scientists whom they had come to know as individuals. Students who had no chance to ask questions during the programs could still pursue their individual curiosity via electronic correspondence. Discussions of issues that were too involved for the broadcasts could be continued on-line. Thus, the pilot provided a demonstration of the unique and unprecedented power of combining multiple media in integrated and imaginative ways.

Re-broadcast and Video Cassette Distribution

NASA Select re-broadcast the programs in January and February 1994, both as single units and in back-to-back blocs on weekend days, and plans to feed them again throughout 1994. Videotapes remain available at NASA's regional Teacher Resource Centers and NASA CORE, as well as by mail from the Planetary Society. Based on the favorable response to the programs, the project extended free educational rights in perpetuity. To support such re-use of the original broadcasts, the interactive on-line resources were kept "live" for an additional two months, through February 1994. The non-interactive background materials are to remain on-line indefinitely to support the use of the pre-recorded programs far into the future. PBS presenting station WHRO reported that no other of their projects has ever generated as much E-mail response and interest as this pilot. Schools as far away as New Zealand and Australia —as well as on the U.S. naval base at Guantanamo Bay, Cuba —accessed and used materials over the on-line networks. NASA's Science Internet fed a compressed video version of the programs to Europe and other locations around the world.

Evaluation: Results and Discussion

In the early stages of such a project, formative assessment helps determine the needs of the participants and effectiveness of different delivery systems. Teacher evaluations documented participation of 1,930 students in 73 classrooms. The majority of classrooms were upper elementary, including fifth and sixth grades (63%), with some middle (37%) and somewhat less high school (5%) participation. Since the pilot targeted middle school students, we were pleased to see this group especially responsive to the materials. Most teachers indicated use in science classes while other cross-disciplinary settings included language arts, computer training, math, and even art classes.

Teacher reaction to the print materials was very positive. Ninety-two percent of the teachers rated all of the materials as "Very Good" or "Adequate." Most teachers would like to receive print materials between one (45%) and two (42%) months before the televised programs but not earlier. 11% of teachers wanted to begin work with the print materials three or more months prior to the live broadcasts. The project recognizes that teacher and student time are very limited resources and that it is important to create a schedule that provides teachers with flexibility and choice in the degree and timetable of participation, as well as in the amount of student time required.

Only about a third of the teachers reported using the on-line networking components of the program via NASA Spacelink, PBS Learning Link, or over the Internet. This technology is new to teachers and the base of people with technical skills is increasing exponentially. There are many efforts to provide teachers with the skills to use the Internet (such as NASA NREN's "Global Quest: The Internet in the Classroom"), but it is vital that projects devote as much or even more attention and effort toward creating the social structure for use of this tool. The goal of this project was not to focus on training technical skills but rather to work closely with teachers to evolve new patterns of teaching and learning using an incrementally more sophisticated and powerful range of new technologies.

A clear majority of the teachers reported that the live character of the programs was either "Very" (71%) or "Somewhat" (29%) important. The excitement generated by student control of the TROV robot from their classrooms was clear: all teachers rated this component as either "Very" (73%) or "Somewhat" (27%) important. But despite the appreciation for such live components, many teachers (68%) were also interested in using the same material again on videotape. This finding supports the development of a package of materials that can be used in the classrooms beyond the live broadcast dates.

Teachers and students also provided important feedback on ideas for potential new electronic field trips. Highest on every list was the rain forest, with great interest also in the Space Shuttle and dinosaurs. This feedback will be used to organize future electronic field trips.

From "Live from. . .Other Worlds" to PASSPORT TO KNOWLEDGE

Through interaction facilitated by an innovative combination of video, live interaction, and computer networking, students in all communities across America were able to take a field trip to one of the most remote regions of the world and encounter current scientific knowledge in the context of its use. Students learned about scientists as people, explored ocean depths never before seen by humans, encountered the latest in robotics and "virtual reality" and participated in science as "lived experience." Via television and computer networks, supported by teacher-mediated in-class preparation and support, they had a unique "passport to knowledge."

This pilot project provided strong support for continuing our efforts in developing electronic field trips in a three-year project called PASSPORT TO KNOWLEDGE. PASSPORT TO KNOWLEDGE is an implementation model for new ways of learning, drawing on the strengths of broadcast television, combined with innovative designs for computer networking and integrated with hands-on, project-based classroom instruction. The project premise is that students learn scientific knowledge best when it excites and informs their own interests and experiences. PASSPORT TO KNOWLEDGE is a project that hopes to take students from all across America on "electronic field trips" via television and computer networks to the frontiers of knowledge where science is in the making. Students can join research teams examining the geology, biology, and astronomy in the Antarctic, investigating biodiversity in the Amazon rain forest, and studying the outer edges of the universe with the Hubble Space Telescope. On-camera and on-line, using technology in an integrated way, students can erase the accidents of geography and time, and stretch their thinking beyond the resources currently provided by their teacher or school. These 21st century field trips are made possible with the televisions, VCRs, computers, modems, and phone lines that are already found in many schools today. This project seeks to develop the human infrastructure of network teaching and learning to make the best use of technical hardware.

When projects require a high investment in teacher time and finances, they are often difficult to implement on a large scale. The pilot project data emphasized the need for teacher choice in the level and degree of involvement. PASSPORT TO KNOWLEDGE is structured to allow teacher choice of various levels of participation with different configurations of instructional components, equipment and cost, from "free" to "fee," and from mail, phone, and fax to full Internet access. Participating teachers can begin with a minimal investment of time and resources and increase their level of involvement as interest and expertise develop. Distributed over public television stations and other satellite educational networks, the video programs will be accessible without cost in schools across America, ensuring equity of access for all to state-of-the-art distance learning materials. The students' guides on these expeditions will be young men and women of diverse backgrounds who have made scientific achievement their personal "passport" to a lifetime of discovery, real-life heroes and heroines finding amazing new patterns in the oceans of data sent back by distant spacecraft, plunging in dry-suits into freezing waters or surveying the rims of semi-active volcanoes. As in the best of traditional field trips, these experts will respond to students' prior interests and conceptions while stimulating them to new insights about ongoing research and current knowledge that has not yet appeared in textbooks.

On-line computer networks will provide a range of integrated and supporting resources, including a library of background information, first-person "Field Journals" written on location by the scientists themselves, and access to real-world digital data-streams. As schools acquire full Internet connectivity, their level of participation with the field research team can be increased and these schools can serve as "tele-mentors" for schools just joining the project.

Student investigations using "live" and archived real-world data, such as information on weather, climate change or ozone levels, will be introduced and supported with print and on-line curriculum materials. Teacher training will be provided over the network, via tele- and audio-conferences and videotape. Under the supervision of consultants who have created other successful networking models, PASSPORT TO KNOWLEDGE will develop, deploy, and evaluate student-to-student collaborations over multiple computer networks, involving both science and communications skills.

Conclusion

We live in an age when television uses satellites to bring pictures of war and disaster from around the globe in seconds. But news from scientific frontiers often lingers for years in specialist journals before appearing in textbooks and school curricula to engage the students who must be the researchers of tomorrow. Today's technology allows us to do much better and permits a degree of interactivity —the "Question and Answer" format that makes a field trip interesting and instructive —past explorers and students could never enjoy. PASSPORT TO KNOWLEDGE will deliver the most contemporary science in an entertaining format, providing unique, face-to-face encounters with distant and exotic places and phenomena and the men and women who are privileged to explore them, using a powerful combination of television, print and on-line computer networks to inform, inspire, motivate, and educate.

Contact Information for Live from Antarctica, 1994

To receive more information on the PASSPORT TO KNOWLEDGE project on-line, send an electronic message with one line of text:

To: listmanager@quest.arc.nasa.gov
Subject:

subscribe updates-lfa

To request print material by mail, send a 9 x12 stamped, addressed envelope to:

PASSPORT TO KNOWLEDGE
Geoff Haines-Stiles Productions
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Panel
Network Learning: New Dimensions in Collaboration

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Abstract

Computers and communications technology are changing the nature of education. Today learners can access educational programs and resources regardless of where they live or when they can attend "class." Computer communications technology is giving rise to a range of new educational contexts. They have in common the use of computers linked in networks to create new forms of access to social and informational resources. But the medium is not the message. Understanding the educational implications requires a focus on the learning activity within the context of the technology.

The goal of this panel is to provide a forum for thinking about group learning in a variety of educational settings that involve collaboration. The panelist will present five network learning projects in which students are involved in collaborative learning. The structures of these projects are similar in some dimensions and very different in others. For example, the first three projects involve elementary and secondary students in cross-classroom collaboration for very specific and different educational outcomes, and the last two involve graduate education in virtual universities. The type of technology used in each model varies from ASCII text to multimedia teleconferencing.

Each of these panelists will discuss the strengths and weaknesses of his or her model in light of the specific educational goals. They will discuss qualitative and/or quantitative project results that indicate how their application of network learning supports or fails to support the construction and maintenance of working communities of practice that include teachers, students, and scientists.

Betsy Frederick *is a member of the Albuquerque Public Schools instructional Technology Support Team and a Coordinator for the International Educational and Resource Network (I*EARN).*

Louis Gomez *is Associate Professor of Learning Sciences and Electrical Engineering/Computer Science at Northwestern University and is Co-Principal Investigator on the CoVis Project.*

Gideon Goldstein *supports students and teachers on the Organization for Reconstruction through Training (ORT) Network in Israel and is a Coordinator for the International Educational and Resource Network (I*EARN).*

Linda Harasim *is Associate Professor of Communications at Simon Fraser University and is a pioneer in the design and application of on-line delivery of university and graduate courses based on collaborative learning models.*

Margaret Honey *is the Associate Director of the Center for Children and Technology. She is the co-project director with Barbara Dubitsky of Bank Street College of the Annenberg/CPB Mathematics Learning Forums Project.*

Margaret Riel *designed the concept of Learning Circles on the AT&T Learning Network and provides support for the Learning Circle Mentor coordinators on-line.*

Hardware/Network Issues

Developing an Infrastructure for Graphical-User-Interface Telecomputing Resources

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Key words: graphical-user-interface, Internet, telecomputing, SLIP/PPP (Serial Line Internet Protocol)

Abstract

A suite of telecomputing resources has been implemented to support collaboration and communication among members of the Houston Consortium of Urban Professional Development and Technology Schools. Funded by a grant from the Texas Education Agency, the consortium is seeking to provide its members with simplified yet full-featured access to electronic information resources available on the Internet and through TENET (the Texas Education Network), and the University of Houston campus network. These resources allow the intensive use of telecomputing by prospective teachers and teacher educators in their planning and classroom activities. They also allow for ongoing discussion and professional support among preservice teachers, university professors, and mentor teachers. An electronic communications station is available in each of eight Centers for Professional Development and Technology schools (CPDTs), each of four participating universities, and regional educational service centers in the Houston area. The electronic communications station includes a Macintosh computer with either a direct Internet connection or a dedicated phone line with a high-speed modem, and a printer, with all of the equipment housed in an area accessible to preservice and inservice teachers.

Consortium members are being linked electronically through e-mail, on-line newsgroups, and a consortium Gopher site, which provides an electronic archive of project documents, a directory of participants, instructional software, and links to other educational resources on the Internet. The significant feature of this telecomputing plan compared to most available telecomputing resources is that all consortium participants are being trained to use graphical-user-interface

Internet resources such as Eudora (an electronic mail application), TurboGopher (a Gopher software program), Fetch (a file transfer application), and NewsWatcher, (an electronic newsgroup application over SLIP [Serial Line Internet Protocol] or PPP [Point to Point Protocol] dial-up connections). The SLIP/PPP connection allows members who do not have access to a direct Internet connection to access and retrieve easily a wide variety of information, such as electronic journals, scientific image files, and hypermedia applications from any location where a computer, modem, and telephone line are available. This allows participants to access the Internet resources from their classrooms or from home, whenever it is most convenient for them. With this type of Internet access, an effort is under way to develop innovative ways to integrate network resources into K-12 and higher education curricula.

SLIP and PPP are evolving pieces of technology that allow computers connected to the Internet to exchange information in a more friendly way than has been possible in the past. With a SLIP/PPP connection, users can access and transfer files using graphical-user-interface tools, which are easy to learn and available free of charge. SLIP/PPP connectivity allows participants to use these easy-to-manage software programs to exchange not only simple text files but also graphic image files, sound resources, QuickTime movie clips, and application files such as Microsoft Word documents, HyperCard stacks, and PageMaker desktop publishing documents. For example, using the TurboGopher application, users can easily transfer, or "download" a HyperCard stack that has been stored on the consortium Gopher site. By simply using the mouse to click on the requested file icon, users choose where on their desktop computer the selected file will be downloaded. In the past, it has been necessary for users to master a complicated series of steps in order to transfer more than simple text files across the network, but with the implementation of such new technologies as SLIP and PPP, even novice computer users can easily master sophisticated data transfer.

Demonstration

Part I. The Electronic SchoolHouse: The House That Teachers Built and Part II. The ScrapBook Project: An On-line Curriculum for Your Curriculum

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Key words: interdisciplinary, multimedia, writing, newspaper, simulation, collaborative learning, integration

Abstract

Part 1
Visit the Electronic SchoolHouse, an electronic teachers' lounge where educators collaborate and link classes in on-line educational activities. Explore this nationwide classroom where students share work, collaborate, and break down the classroom walls. Learn about Westward Ho!, the SchoolHouse News Bureau, Egg-A-Thon, ScrapBookUSA, and projects not yet invented. Chat on-line with SchoolHouse teachers and link to SeniorNet, the Consortium for School Networking, the Christa McAuliffe Foundation, LabNet, and more.

Part 2
The ScrapBook Writing Project is an interdisciplinary, multicultural program linking classes and individuals from distant places in informal writing and formal on-line publishing. Writers from 9 to 90 describe the people and places, the treasures and traditions of their communities. This session will explain how informal ScrapBook Chronicles lead to exchange of ScrapBook Chapters, Illustrated Editions, and HyperChapters, how writings are celebrated in Scrapbook FAVORITES, and how all concludes with an on-line finale costume party and electronic food fight. ScrapBook has been recognized as a Connecticut Celebration of Excellence (IMPACTII) project.

Policy
The Electronic Village: Three Years Later

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Key words: telecommunications, Internet, qualitative research

Abstract
COIN is a telecommunications project developed for the community of Columbia, Missouri. Services are free to registered users, and Internet connections are available. After three years of avail-ability, an evaluation was conducted regarding the value to teachers and students in the public schools.

Columbia Public Schools, in collaboration with the University of Missouri—Columbia, the city of Columbia, the Daniel Boone Regional Public Library, and the Missouri Research and Education Group developed and financed a telecommunications project called COIN (Columbia On-line Information Network). This project provided to the community access to local, regional, and national information through Internet connections, free of charge. Those individuals involved with the project from the public schools envisioned a global classroom for the students of Columbia. Students would be able to obtain Supreme Court decisions, oceanographic databases, NASA materials, college entrance requirements, scholarship materials, and other information worldwide.

After three years of service, has the public school seen a significant difference in the way students obtain information? Have teachers changed teaching methods as a result of new information available to them through the Internet connection? Are teachers even using the Internet connection to enhance or reinforce their teaching materials? These are a few of the questions Columbia Public schools have asked in connection with the COIN project. When adopting an innovation there comes a time to step back and evaluate the process made thus far and how it compares to the original plan.

To evaluate the telecommunications project within the Columbia district, an ethnographic study was conducted. Observations of students and teachers using COIN were done as well as informal interviews. In addition, interviews were conducted with a sampling of teachers known to have passwords on the COIN system and to have had advanced Internet inservice training. This method of evaluation provided a broad-based overview of how the system was being used, and who was using it With such qualitative data on the COIN system, administrative decisions can be made regarding growth and training.

Two specific facets will be addressed in this presentation:

1. *Overview of COIN and the resources it provides to the Columbia community.*
2. *Summary of the evaluation findings regarding students' and teachers' use of the Internet connection through COIN.*

Teacher Training
An Introduction to the Internet: A Twenty Hour Workshop for Teachers

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Key words: education, telecommunications, teachers, workshop, Internet, modem

Abstract

This session presents a curriculum developed for a twenty-hour workshop titled "An Introduction to the Internet for Teachers." This workshop is oriented toward beginning telecommunications and Internet users. It covers basic telecom setup, theory, and practice. It is intended to give students (teachers) broad experience using telecom and the Internet, rather than in-depth knowledge of a single area. The workshop explores some of the on-line resources available on the Net. Exploration and problem solving, rather than narrow expertise, are the emphases of the class. Over 50 percent of class time is spent with students on-line.

Preparation

Students used two access methods for learning telecommunications: a microcomputer connected to a modem for dial-up access, and a microcomputer/node connection (a microcomputer with an IP address which would run Internet client software such as Turbogopher and Mosaic). Guest accounts were established at a campus Internet host. A similar class was contacted in another state so that students could learn about e-mail by communicating with teachers at another location.

Topics Covered

The following is a brief outline of the course. Each topic is demonstrated for the class and is followed by time for students to practice on their own. Lecture and demonstration are concentrated in the first few days; during the last two days more time is devoted to project work and individual assistance with students.

Student Projects

Each student chooses a topic to research on the Net. This topic will be researched using Internet tools learned in class. Students are to use as many Net tools as possible to find information relevant to their topics. A log of actions taken should be kept, with a separate list of identified Net resources for inclusion in the research project report.

Suggested Readings

Students are to purchase at least one book that describes Net tools and how to use them, and a reference book that identifies Net resources and where to find them. Several are suggested.

Day 1:

A brief history of Internet and an overview of Internet tools
The UNIX environment: login & basic commands
Mailers: using pine, mail to teacher, keypal, others in class
Editors: using pico, create a text file, import it into pine
Listservs: subscribe to a list and an emag, show "list of lists"
Modems & telecom software: physical setup; configuring; dialing

Day 2:

Internet maps; how Internet works (TCP/IP), who pays for it
More UNIX: finger, talk, signature file, .plan file, and more commands
Telnet: connecting to other computers
Usenet newsgroups: .newsrc file, subscribing, using nn, posting
Netetiquette: What to do and what not to do
Student research topics established

Day 3:

The national information infrastructure and commercial networks
Gopher: what it is and how it works
World Wide Web and Mosaic: what it is and how it works
OPACs: what they are and how they work
Begin working on student research projects

Day 4:

Archie: finding files
FTP and ncFTP: how to transfer files between hosts
File types, extensions, and compression
Uploading and downloading files using a modem: demonstration and practice
Work on student research projects

Day 5:

Answer questions, individual consultations for special needs
Work on student research projects

Comments

On the first day I explain to students that using a computer to access the Net is much different from using computers for most other purposes. Unlike using a well-designed application in which there are clear ways to do things, the Net is an "info-sphere" where exploration and problem solving are the general rule. While there are some rules and some well-developed tools on the Net, they don't always work. There is not a comprehensive index or table of contents for the Net. Effective use of Internet requires considerable knowledge and study; it is NOT user friendly (but is becoming more so). "Expert" use of the Net requires many hours of practice, constant referral to manuals and how-to books, and a fairly broad (and sometimes deep) understanding of computer concepts. This course is only an introduction; we will not look at all of the Net tools. Students are encouraged to "learn how to learn" on the Net so that when they are on their own they can solve problems and get help on-line.

Paper
Interactivity Versus Virtual Interactivity: Which Does the Research Support?

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Key words: interactivity, television, distance learning, low-cost television

Abstract

Almost everyone will agree on the positives which surround the concept of interactivity. After all, the learning process is an active process. Therefore, it follows that an interactive television course is far better than a noninteractive, "passive" one. At least that is what many believe.

The term "interactive" in this paper refers to the kinds of course-delivery systems presently being embraced by many educators and media practitioners alike. Because of this rush to acquire costly technology that it is more important than ever to take an objective look at outcomes and to explore the less cumbersome, costly, and restrictive alternatives that exist or are emerging. To begin this exploration we will examine the seemingly simple concept of interactivity and the foregone conclusions that accompany it. It has been shown that a great deal more thought and research are needed to ascertain the when, where, why, and how of that which many take for granted.

Research comparing the relative effectiveness of classroom versus television (interactive versus non-interactive) exists in abundance. This calls for an examination of our widespread acceptance of the "new" technologies. Opportunities to serve even greater numbers of non-traditional students are, perhaps, even greater than proponents of full interactivity systems realize. Further, more institutions with more restrictive capital and operational funding can realize opportunities for participating in technologically delivered courses by embracing the concept of "virtual interactivity."

Full interactivity, despite its perceived necessity, is not without baggage. However, virtual interactivity, which employs a variety of existing and emerging technologies, may be utilized with comparable results. The concept of virtual interactivity will open economic and flexibility options without denigrating the quality of instruction. In addition, an ever-increasing clientele spread out over an ever-widening geographic base can be served.

Interactive systems are here, or are about to be here, by their sheer momentum. It is in reality a convention before the fact. For those who insist on that which has already become conventional, "intermittent interactivity" at a fraction of the cost promises to provide learning outcomes equivalent to full interactivity. Intermittent interactivity frees live capital-intensive system time and facilities when interactivity is not critical, or when virtual interactivity is sufficient. This option can greatly increase the number of courses using a single two-way "channel."

Despite the fact that interactive technology seems to have been configured a certain way, there are options/variations that enable more institutions to be involved and provide desirable instruction to wider audiences while maintaining the quality of instruction and learning outcomes comparable to the cost/technology-intensive systems. While it is true that at least some students benefit from immediate feedback, it seems equally true that many more, especially those who are highly motivated, do just as well—if not better—without it. Further, we often lose sight of the variance in learning styles and personalities that tells us that some students, especially the less outgoing, seem to thrive in a learning situation that does not include the stress of group interaction and exposure. As desirable as they may seem, interactive television media introduce significantly higher costs, and severe geographical and scheduling limitations. Research results have yet to substantially support claims of any great value derived from interactivity. To quote Russell: "No matter how it is produced, how it is delivered, whether or not it is interactive, low-tech or high-tech, students learn equally well with each technology and learn as well as their on-campus, face-to-face counterparts. . . "

Of course, you cannot talk back to a television screen and be heard. But just as a good story on television is something that can elicit strong emotional reactions, so too can a good teaching performance bring about a kind of interaction that can involve the student and therefore facilitate learning as well as the enjoyment of learning. VideoClass System students at North Carolina State University in Raleigh tell of learning and knowing that they are learning. They mention that they feel as if they were with the teacher in the classroom, sometimes even feel compelled to speak aloud to the teacher. Naturally, interactivity is desirable for those who can benefit from it—but at what cost? Based on the VideoClass System experience, there is some question of interactivity's being overrated, especially since some potential students are not getting the instruction they need because interaction is not practical. To quote Stone: ". . .students do not suffer from the inability to talk back to faculty in real time. . .distance students perform better where they control not only where but when learning occurs."

As our nation rapidly heads onto the fiber-optic-based "information highway," it is becoming increasingly important to develop new systems with foundations rooted in critical analysis of research and experience. The present rush to spend precious resources seems to be ignoring both.

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Panel
Educational Publishing in the Digital Age: Emerging Network-Based Knowledge, Products, and Services

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Key words: electronic publishing, mosaic, hypertext, multimedia, Gopher

Abstract

Computer networks are revolutionizing the ways in which information is distributed to learners in communities, schools, and classrooms. The educational publication industry is committing resources to develop products and services that can meet the ever-increasing demands of the education community for timely, quality, and relevant information. A whole new industry has emerged in the network-curriculum providers.

New Paradigms

Electronic publishing is now an accepted means of providing critical information to teachers and students, as well as education managers. We have witnessed a proliferation of e-journals, e-letters, and digital books, and indeed the emergence of the electronic bookstore. There are educational listservs on all sorts of topics, proprietary education networks, and network-based curriculum packages. Gopher servers located around the globe contain a wealth of information for educators and learners that can be instantaneously available to local servers. On the horizon, there are new powerful products that are supported by client/server software such as MOSAIC. These multimedia, hypertext products allow learners to access information in an exciting and dynamic manner and support new kinds of knowledge-building activities.

In this dynamic arena, teachers and students are emerging as publishers and knowledge-builders. The technology and the open environment supported by Internetworking encourage individuals with creativity, expertise, and interest to share their knowledge and creative works using the networks not only to gather and collate information but also to publish and distribute the information to a vast new audience. School-age children and their teachers are putting up Gophers, creating Mosaic home pages, and developing new network-based curriculum. They are finding ways to apply advanced technologies in the classroom and in turn to share that knowledge with other classrooms around the globe.

Critical questions, however, remain to be answered:

- How will these new products be valued?
- How will the quality of product and service be ensured?
- What are the legal and socioeconomic implications of increasing numbers of student and teacher publishers?

In this panel we will discuss some of these newly emerging products and services designed for the education community, including education networks, network-curriculum programs, and new directions in electronic publishing (e-letters, eduGophers, and eduMosaics). We will discuss some of these critical issues that will affect not only the educational publishing industry but also, and most significantly, the learning process.

Paper
Do We Have the Media Infrastructure to do Multimedia?

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Key words: multimedia, telecommunications, infrastructure, higher education

Abstract

How well positioned are we to develop multimedia? Multimedia requires expertise in video, sound, and data communications. Those institutions that have traditionally invested in television/radio and data networks may have several advantages over those that haven't. This study examines current support for, and interactions among, the various media.

Introduction

Developing and implementing multimedia require video, audio, and data resources. This paper reports the results of an examination of the current media infrastructure of higher education. This examination demonstrates the "health" of these resources. Those institutions that have invested in television/radio broadcast stations and studios and data communications networks were identified. Then a historical survey of these universities and colleges was conducted to see if they have established the foundation for creating multimedia.

Those institutions that have broadcast television/radio stations and data networks may have advantages that the others do not. These advantages include libraries of video and audio materials, archived data, technical expertise, curricula in place, an installed user base, and a supportive environment for innovation.

The 1991 Study

In 1991, only 62 colleges and universities among the approximately 3,400 in this country had invested in the full combination of television, radio, and data communications (Schaeffer & Olson, 1991). Institutions with broadcast television and radio stations were identified through licensing records of the Federal Communications Commission. Those with data communications networks were identified through the Network Information Center listings of nodes on the Internet.

Through secondary sources, we identified 900 universities and colleges across the country that had invested in one form of telecommunications. These include 62 schools with radio stations, television stations, and data communications.

Eighteen percent provided data communications. An additional 23 provided data communications along with radio or television stations.

Over half (52) of the schools did not offer data communications, even though 38 schools had both radio and television stations, 366 schools had radio stations, and 65 schools had television stations.

Current Study

The results of the current study could be viewed as very positive. The number of colleges and universities involved in the study has grown to over 1,400. The results could also be viewed negatively, since the rise in the number of institutions involved is due only to the growth of the Internet.

The Internet. The 1991 study established that 369 colleges and universities had data communications networks. To arrive at this number fairly, the study examined the resources available on the Internet at the time, but because of the fragmented nature of the network, a secondary source was consulted. The object was to try to include as many colleges and universities as possible. Some of the activities going on at that time involved schools that were transitioning from BITNET to the Internet and from UUCP-only nodes to Internet nodes. Thus at least 50% of the institutions that owned radio and/or television appeared not to have data communications networks. This was of great concern and is interestingly, still the case.

Although there are currently 1,400 or more (and the number grows daily) on the Internet, about 300 out of the 760 institutions that own radio and/or television stations still do not have data communications. This leads to the question of why these institutions are involved in broadcasting. In some cases, it appears to have little to do with teaching or research. Can these institutions truly be interested in achieving the potential benefits that multimedia may have to offer?

Radio

The association between higher education and radio station ownership has a long and interesting history. For the purpose of this paper, the importance of radio ownership falls into a couple of the aforementioned benefits. Any institution will benefit from the technical expertise that would be available on campus to operate a radio station. Further, administration would benefit from the enhanced managerial expertise that the operation of a radio station affords the campus. The faculty has the potential to participate in the development of programming on a campus-owned station. Finally, the archive of sound that will be necessary for multimedia, particularly local sound, is likely to be developed only for the radio station and not in the traditional library.

There is modest growth of radio station ownership among colleges and universities during this period. In 1991, 590 institutions owned radio stations. In 1994 there are approximately 680 institutions. There is, however, once again disturbing news. Many junior and community colleges appear to be making a run on station licenses. In some cases, one community college may own as many as four or five stations. These kinds of investments seem to be financially related and a means of broadcasting classes, e.g. the same materials to a larger geographic area. However one wishes to view this use of radio to broadcast teaching, it is clear that this use contributes nothing to the development of a multimedia foundation. For example, an interview with one community college faculty member revealed that because faculty own the broadcasted lectures as intellectual property, the material is erased after the contracted usage of the material is complete. In this case, the instructor did not even have a copy of the broadcasted lectures. The result is that no archive is being built.

Television

The operation of a television station provides the same benefits as those noted above for radio, plus the development of a video library, particularly of local events. Television offers us the saddest news from the current study. In the first study, 187 of the participating institutions that owned television stations. There are now 106. Many of the institutions simply could not afford to keep up with these escalating costs of producing televised materials, and others simply decided to choose less expensive means of providing the same learning situation for students, i.e., moving to cable access.

This is also bad news for multimedia. It is clear from the television and radio examples that broadcasting teaching does not seem to require video. This point is made clear when one looks at distance education and discovers that these systems are arranged to be interactive. The reason this is bad news for multimedia is simply that it appears institutions are not going to invest in developing multimedia. To be completely cynical, broadcasting teaching seems to be the cost-cutting goal of the day and expensive means of teaching will not be supported.

Integration

When the first study was done, the most surprising news was that there were only 62 colleges and universities that had invested in all three telecommunications technologies. This seemed to be an extremely small number, but we assumed that as the Internet grew the number would increase. This hasn't been the case. The current study reveals fewer institutions with all three media. In 1994, the number of institutions with all three media has dropped to under 50. This is partly because of the decrease in the number of institutions that own television stations.

This is particularly alarming from the standpoint of a video library. If a college or university has the facilities and has already invested in establishing such a library, the materials can be used in the production of multimedia products. If an institution does not have such a library, two major problems ensue. The first is the huge investment involved in obtaining video libraries. The second is acquiring the rights to use video materials in multimedia products. If an institution owns their own, they can capitalize on the investment with multimedia. If they do not, they are going to have to pay someone to get the materials if they are going to develop multimedia.

This could be an indication that the American faculty will not be developing multimedia because they do not have the requisite resources. In the end, one is left with the overwhelming feeling that despite the potential of multimedia, it will become an entertainment-only medium like network television. This may not really be a problem for higher education, except for the problem of communicating to students brought up in a culture that contains a great amount of this kind of entertainment.

Conclusion

The use of the integrated telecommunications technologies as a means for developing multimedia has implications for equity of access issues and it also affects academic freedom. If, as one supposes, the elite group of institutions that have all telecommunications resources and multimedia centers are the leading research universities, it might be reasonable to assume that benefits will be diffused throughout the academic community. But if the universities and colleges that have the resources are not the ones that have traditionally been in the public eye, the question can be raised as to whether the telecommunications and multimedia technologies can be used to exclude rather than include all members of our culture.

There are important questions for the majority of institutions that have not invested in telecommunications technologies in the past. Should there be equitable access to the raw resources used to develop multimedia? If there should be, how do we ensure it? Should we be content to let those institutions that have the resources develop the multimedia we implement? What implications would this have on our academic freedom?

References

Schaeffer, Donna M., & Olson, Patrick C. The Need for a national policy of telecommunications in higher education. *Conference Proceedings of Computers on Campus, 93.* Columbia, SC: University of South Carolina, 1992.

Community
TEAMS -Telecommunications, Community, Vision, & Purpose: A Graduate Program

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Key words: telecommunications, collaboration, master's degree, leadership, vision, community

Abstract

Telecommunications facilitates ongoing, powerful learning in Long Island University's TEAM program. TEAM is a master's degree program in technology in education, a program that develops leadership, change, and the use of technologies to drive vision, purpose, and principles of learning. This session will explore the power of TEAM and the use of telecommunications in synchrony with face-to-face sessions to build a learning community.

Telecommunications fundamentally supports the major evolution in our Educational Technology Master's Degree program. Begun in 1983 the program has evolved today quite differently from traditional classrooms, time and space blocks, and academic curricula. Our TEAM programs combine face-to-face sessions (four hours weekly) with time and place shifting facilitated by telecommunications. We seek students who have a spirit of challenge and excitement for learning that is self-directed, timeless, and built upon meaningful and compelling evolution of vision. They join TEAMs of twenty students with several faculty mentors and must use a home computer with a modem. Learning continues electronically between sessions with sharing, discussion, planning, collaboration, and growth over 24-hour days and 365-day years. Master's degrees are conferred at the end of two years.

All students and faculty become conceptually "learner/citizens" learning about themselves, their community, and society while addressing issues of educational purpose, leadership, learning, and accomplishment. They are driven by the continual definition (both individually and collectively) of a compelling, shared vision of learning—ever-evolving throughout the program and beyond. They delve deeply into the literature (accessed electronically locally with CD-Roms and remotely via the Internet). They see all people and all resources as potentially within their reach. Each student must demonstrate scholarship, growth, learning in multiple arenas, and must contribute to the community.

The past four years of TEAM have been extraordinary. Tightly bonded family-like entities have grown in ways and in strengths not anticipated, including individuals' and collaborative groups' taking charge of their own learning, defining their needs and desires, and taking responsibility for accomplishments and their communications. Rather than spend most face-to-face time "teaching" about various technologies while relating them to scholarship and research, teachers spend time demonstrating what HAS been done, HAS been learned, WILL BE done or learned, and DOING research or collaborating on projects that will "make a difference."

Several telecommunications tools are used. E-mail is used for banter, administrative purposes, and substantive TEAM work. VAX Notes, an electronic conferencing system, is used to dialogue on individual and group topics. Students are active in defining the structure of the conferences opened and closed and their greatest use. At the moment, conferences include:

1. *scholarly discussions of readings*

2. *TEAMs addressing individual TEAM issues*

3. *multi-TEAM dialogues*

4. *planning conferences at which students identify their areas of interest and expertise, discuss their growth in readings in those areas, and their plans and progress "doing" something to make a difference in their community*

5. *"how-to" conferences, where tips, tricks, and problems are addressed on specific software and/or hardware.*

Finally, students are exploring the potential for the next step, one that will use newly acquired distance-learning equipment opening fully- mediated voice, video, and data transmission over fiber-optic cables. This session describes what has happened as it relates to telecommunications and what it means for today and the future of learning.

Modern Language/ESL

Enhancing Writing Instruction with E-mail: Tools and Techniques

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Key words: composition, teacher training, Hypercard emulation, elm

Abstract

The benefits of using e-mail for remote communication and information exchanges in the writing classroom will be discussed, as well as the difficulties in setting up and conducting such exchanges, teaching e-mail basics, and motivating students to get on-line. Recommendations for implementing a successful collaboration will be included.

Project Design

Incorporating e-mail into a writing course need not be intimidating for a new or an experienced user. In this presentation I will provide a feasible plan for using e-mail as part of a course whose aim is to teach academic style prose and the basics of essay writing. Second, I will give the teacher some suggestions for setting up an e-mail collaboration and tools for teaching the basics of e-mail and information gathering. Last, I will share my students' evaluations of the effectiveness of Fall '93 and Spring '94 projects, as well as my own plans for improving these types of exchanges.

In the Fall of '93 project, my students participated in a triad with Ruth Vilmi of Helsinki University of Technology and Andrew Hess of New York University. Linking three classes did not provide the students with regular or sufficient correspondence, however. Also, topics were not assigned by the teachers, resulting in confusion as to the purpose of the exchanges and how they related to writing goals. With Ruth as the coordinator, we improved on the project design in Spring '94 by expanding it to include a total of nine teachers and refining the project design, based on our collective experience. The number of students grew to 240, representing 30 nationalities, and the course included participants from classrooms in the United States, Finland, and Hong Kong.

Before the students ever went on-line, we were able to agree on such key issues as:

- term dates and deadlines
- topic selection
- nature of writing task
- guidelines for mailing messages
- monitoring participation
- amount of teacher participation in topic groups

As a result of these discussions, mailing lists were set up for the 240 students based on their choice of topic, which provided much-needed structure for the writing assignments. Students chose one topic from a list of 40 to participate in for writing assignments. They were given similar assignments, e.g., introductions, summary of newspaper or magazine article, survey questions, and they were required to write at least one message per week. A "handout" on "E-mail Tips and Pitfalls," sent by one teacher, was circulated by other teachers to acquaint students with netiquette.

The teachers' list also generated valuable data about the scope of the project and the participants themselves (students and teachers). Sharing successful techniques, materials, syllabuses, and technical advances has also been a big plus. As the semester progressed, the list facilitated many exchanges on how to modify and improve the project.

This teacher-to-teacher communication was an important factor in setting up a successful e-mail collaboration; however, the students' evaluation also played a part in refining the design of the Spring '94 project. At the American Language Institute, feedback information was obtained in two formats: (1) an e-mail evaluation form which asked about their performance, level of interest, and technical difficulties with using e-mail. and (2) a traditional course evaluation. Many teachers had students write an essay about their participation in the project in lieu of an evaluation form. The feedback has proved invaluable by pointing to the need to increase interactivity, a shortcoming of the restructured project.

Teacher and Student Training on E-mail

A practitioner need not be an expert to use e-mail in the classroom, though it is vital to have access to network consultants. With the aid of a Hypercard program that emulates the "elm" mail program and print materials, I will demonstrate the basics of message sending, replying, forwarding, and retrieval, and include an on-line proficiency test I administered before proceeding to more advanced applications, such as FTP, and downloading and uploading files. I will describe the technical competencies required of the teacher and the student, many of which can be acquired as the semester progresses. Once you get on-line, a wealth of resources exists to assist you—TESOL archives, listservs, such as TESCLA-L, and even a newsgroup called alt.e-mail.projects formed by Ruth Vilmi! One of the most exciting benefits is that on the Internet, we all become both teachers and learners.

Math/Science
SalsaNet: A Bulletin Board System for Math and Science Teachers

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Key words: bulletin board systems, mathematics education, science education

Abstract

In 1985, with funding from the National Science Foundation (NSF), the College of Education at the University of New Mexico set up a computer-based information service, called CISCONet, for science teachers throughout the state. Under the direction of Paul Tweeten and Jack Gittinger, CISCONet provided e-mail, bulletin boards, public domain software, a document library, and contact with national laboratory scientists. When the NSF funding ran out, CISCONet was maintained by the College of Education and has been accessible through one state 800 number and one local number. Gene Lott, the Systems Operator for the Educational Native American Network (ENAN) kept CISCONet running on a volunteer basis. One limitation of CISCONet has been that it has not offered access to the Internet.

In 1993 plans were begun for reviving and updating CISCONet. By early 1994, Carmen Gonzales and Tom Ciccateri were assigned as Systems Operators. Dave Hughes, the renowned Cursor Cowboy, a champion of low-cost, easy-access networks such as the Big Sky Telegraph in Montana, shared his ideas on how to upgrade CISCONet and expand its viability and usefulness. On a technical level, that has meant upgrading to a 486 host computer and changing from TBBS bulletin board software running on DOS to the Lora Bulletin Board System running on OS/2 with connection to the Internet. Internet users with Telnet capabilities can actually get into the bulletin board system by Telneting to salsa.unm.edu. Dial-in access is available by modem in the Albuquerque area at 277-1010 and from the rest of New Mexico at 1-800-792-5203. Menus have been redesigned and a new name has been chosen. CISCONet was an acronym for

Computers in the Science Classroom with an O thrown in to give it a southwestern flavor. It has caused some confusion because Cisco is also the name of a kind of router. The new name Salsanet contains no acronym and was chosen by a group of supporters of the idea of a network for K-12 educators in New Mexico. Salsanet users can choose to have menus in either English or Spanish. Salsanet seeks to collaborative with individuals and institutions interested in mathematics and science education.

As of August 1, 1994, here is how the Main Menu looked in both English and Spanish:

****
* **SalsaNet** *
****

<1> Announcements Board	<2> Organizations for Teachers
<3> Funded Projects	<4> Sandia National Laboratories
<5> LANL Science Education & Outreach	<6> Teachers' Lounge
<7> Council on Technology	<8> La Resolana Electrónica

########################## Special Services ##################################

<A>ctivities & Lesson Plans	<N>ew Product Information
<D>ialogue (topical discussions)	<O>ffline Reader
<E>lectronic Mailbox (private e-mail)	<P>rojects & Grants
<F>iles Area	<S>ystem Information
<I>nternet Gateway	<T>echnical Questions and Answers
<M>ap of SalsaNet	<U>ser Setup Information

<G>oodbye <H>elp Minutes Left >/

****
* **RedSalsa** *
****

<1> Tablero de Anuncios	<2> Organizaciones para Profesores
<3> Proyectos Financiados	<4> Laboratorio Nacional Sandia
<5> Extensión Educativa de LANL	<6> Salón de los Profesores
<7> Consejo de Tecnología	<8> La Resolana Electrónica

######################### Servicios Especiales ##################################

<A>ctividades y Planes de Lección	Inf. sobre Productos <N>uevos
<D>iálogo en Línea	<L>ectora fuera de Línea
Buzón <E>lectrónico	<P>royectos y Donaciones
<B>iblioteca de Archivos	Inf. sobre el <S>istema
Entrada al <I>nternet	Intercambio <T>écnico
<M>apa de la RedSalsa	Modificaciones del <U>suario

<G> Salir <H> Ayuda Minutos que le quedan >

Math/Science

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Key words: systemic reform, on-line communities, mathematics, science, business partnerships

Abstract

Recent content standards in mathematics and science have defined an exciting new vision for education. Teachers, parents, community members, business/industry partners, and state policymakers are joining in dialogue and action to move schools forward toward the 21st century. Many of these efforts have an on-line community as an integral component. Education Development Center, Inc. (EDC) houses two projects that are actively involved with on-line communities.

The Statewide Systemic Initiatives' SSINet and the Teachers' Resource Network's CDTNet presentation will address the following:

- *What does a network offer school reform?*
- *What are the characteristics of each network?*

- *Who are the participants?*
- *What types of discussions have emerged over the network and in what directions have they moved?*
- *How does EDC support discussions of the vision of what best practice is?*
- *How have the on-line discussions influenced practice?*
- *How have the technical features of the network influenced the dialogue?*

The Statewide Systemic Initiatives (SSI) program is a major effort, funded by the National Science Foundation (NSF), to encourage improvements in science, mathematics, and technology education through systemic changes in the education system in twenty-four states and Puerto Rico. Each initiative focuses on creating new relationships among several individuals and agencies in order to articulate and carry out a state vision of what mathematics and science education should be.

Working closely with the NSF, EDC's Technical Assistance Project is designed to help states identify and utilize cutting-edge knowledge in curriculum, instruction, school structure, and assessment. The project staff operates SSINet, an electronic communications network that promotes open discussion and sharing across the states, involving several hundred participants. Out of this group, ongoing communities have formed on-line. These vary in their scope and nature, but include business/education partnership conversations, teachers, project directors, and technical assistance providers involved in dialogues.

We will discuss these SSINet conversations from the perspectives of EDC technical assistance providers, a businessperson from a state SSI, and a project director.

The Teachers' Resource Network, funded by the DeWitt Wallace-Readers' Digest Fund, was designed to help K-8 teachers transform their mathematics teaching practice so that it more closely reflects recommendations contained in such mathematics education reform documents as the National Council of Teachers of Mathematics Curriculum and Evaluation Standards for School Mathematics. Small inquiry groups of teachers meet regularly within their districts with a facilitator to explore resources that help them rethink mathematics teaching, learning, and the nature of mathematics itself.

The electronic network CDTNet is used to extend the conversations begun in the inquiry group setting, connect teachers in different inquiry groups with each other, and provide opportunities for facilitators and project staff to participate in these conversations. There are eight conferences on the network, including assessment, diversity, students' understanding of mathematics, and project news. Participants use the network for private chats, public discussions, and e-mail. The project is exploring what can be learned about how teachers use resources. This information will help provide insight that can be used to inform further reform efforts.

We will discuss these conversations from the perspectives of the project director, a technical assistance person, and a teacher from the field.

Panel

Forming Robin Hood's Band: New Paradigms for Collaboration, Ideas, and Funding

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Key words: collaboration, on-line, communities of interest, funding

Abstract

Much of the power of the Internet derives from providing individuals a means to create ad hoc "communities of interest," which replace traditional hierarchies and cues (relative to age, sex, culture, or race) with a simple valuing of ideas and how well they are expressed.

A glimpse of what can be achieved by combining the "physical" and "virtual" communities was provided by last year's CoSN/FARnet project, which established six weeks of on-line discussion in focused topics and culminated in a meeting of more than one hundred of these participants at a two-day process-oriented workshop designed to distill the outcomes of these on-line and face-to-face deliberations.

An inevitable culture clash occurs with the introduction of public funding into this environment. The ethos of the Internet (freely shared information in a flattened hierarchy) is antithetical to the perceived well-being of organizations competing for the same pool of funds. Boards of these entities may regard proposal development as so mission-critical as to resemble "state secrets," and discourage discussion between individuals who previously identified as citizens of the same "community of interest." In fact, this phenomenon was noted prior to the grant deadlines of both the NSF NIE program and the NTIA Community Networking program, in terms of a marked decline in both e-mail traffic on related listservs and private e-mail messages between potential collaborators.

On the CoSN discussion list, and subsequently on the CoSN Gopher, one remedy to this situation was pursued, the "Proposed Idea Exchange," where anyone brave enough was encouraged to post the narrative of their grant proposal projects. Indeed, panelists who have reviewed such projects have repeatedly remarked that several individual proposals could have been funded if only the applicants had taken the time to learn what other entities in their states or regions were proposing and had then collaborated on a single proposal.

The overarching reality is that not all worthy ideas will be funded. Furthermore, compared to the current K-12 population of the Internet, the "unwired masses" represent a far larger

"immigrant" group than faced America a century ago. Current users are a much smaller proportion of the whole than the original pioneers represented by the time of Manifest Destiny. Who will be the Emma Lazarus of the Internet? People who can see beyond the parochial needs of their employers, who can create benefits freely accessible to all clearly deserve greater consideration in the disbursement of public funds, given these realities.

Our panel intends to address the following issues using a combination of targeted listservs and the CoSN Gopher between August and Tel•Ed '94 in November:

- *What paradigms can make use of new on-line relationships?*
- *How could current granting processes be advanced by new models for on-line collaboration?*
- *What mechanisms can the on-line community provide to potential funders to identify individuals and organizations who can deliver results to the wider on-line community?*
- *What can be done* now, *without funding, but with a free flow of information, to advance the prospects for bringing schools on-line?*

John Clement, currently at the National Science Foundation, previously created the Consortium for School Networking, an organization dedicated to bringing all classrooms on-line by the year 2000. He will, as an individual (not as a representative of NSF), be able to shed light on the constraints that funding organizations face in terms of the "proprietary" nature of grant applications and the need for communication between members of the field.

Margaret Riel, as an experienced mentor of on-line communities with the AT&T Learning Network, can address what it takes to build, nurture, and sustain groups of individuals as they grow into roles of responsible on-line citizenship.

Mario Zinga, as an architect of the Common Knowledge: Pittsburgh project, has already set an exemplary model in posting all of his organization's grant proposals and technical documentation on-line. The issues surrounding the desire to post information in a timely manner, yet maintain the academic standards of veracity in an ebbing, changing electronic sea of information will be instructive to those who are considering following in his footsteps.

Kathy Rutkowski, as publisher of NetTeach News, has seen all manner of grass-roots efforts from a national perspective. The needs of the field, and the tension between global knowledge and local action, are areas for which she has accepted a multitude of challenges, and she will share her insights.

Frank Odasz, as creator of BigSky Telegraph, resource director of the Reach for the Sky Project (recipient of major funding from the Annenberg/CPB/US West Foundations), and consultant with the Morino Institute, will add the perspective of rural networking needs and successes, combined with those of successful grant writer and facilitator of community networks, seeking new models for collaboration on-line.

Michael Waugh is a pioneer in the concept of telementoring, having created and grown a preservice and student teaching program at the University of Illinois at Urbana/Champaign. His views on the role of "communities of interest," as well as their care and feeding, will add an important dimension to the discussion.

Pre Tel•Ed '94 Activities

On the CoSN discussion list, and subsequently on the CoSN Gopher, one remedy to this situation was pursued, the "Proposed Idea Exchange," where anyone brave enough was encouraged to post the narrative of their grant proposal projects. Indeed, panelists who have reviewed such projects have repeatedly remarked that several individual proposals could have been funded if only the applicants had taken the time to learn what other entities in their states or regions were proposing, and collaborated on a single proposal.

The Proposed Idea Exchange was announced on several education-oriented listservs and included this explanation on the CoSN Gopher:

About The Proposed Idea Exchange

This area is intended to create an environment where ideas that have been proposed, whether funded or not, can enjoy the benefits of examination, experimentation, and feedback by real people who use this technology every day.

Papers, guides, narratives, maps, charts: all materials that will help explain your point of view on any of the following topics are welcome:

- Community network development
- Scalable network access by linking LANs to the net via Cable TV
- Systemic reform of education through technology
- Teacher preparation, transformed through on-line Support
- Technology Transfer from Affluent to Low Income areas via the Net

Discussion on the materials and concepts in this area are welcome on COSNDISC. Please reference the area on the subject line and cite the materials in the body of your text.

To add your materials or suggest a new topic, please e-mail both a short overview of the document and the file itself to: ferdi@cosn.org

The initial structure of the Proposed Idea Exchange looked like this:

1. About the Proposed Idea Exchange.
2. Community Network Development/
3. Idea Exchange References/
4. Scalable Network Access: LANs to Cable TV to Internet/
5. Systemic Reform of Education through Technology/
6. Teacher Preparation, Transformed through On-line Support/
7. Technology Transfer from Affluent to Low-Income Areas/

The first offerings followed the May deadline for the NTIA grant, and came from the LifeLearn Community Network proposal, from Princeton, New Jersey, and the National Parent Information Network, from ERIC.

The NPIN included the following description:

The National Parent Information Network
A New National Resource for and about Parents

The ERIC Clearinghouse on Elementary and Early Childhood Education (ERIC/EECE) and the ERIC Clearinghouse on Urban Education (ERIC/CUE), components of the ERIC system, have joined forces to create a new national resource for and about parents. The National Parent Information Network (NPIN), a demonstration project, will be accessible to all national, state, and local audiences, primarily through the Internet.

Other Information
Other valuable information came from John Mundt, of Glenview, Illinois, specifying what is required to connect an entire district to the Internet using Cable TV. A pointer to the Morino Institute documents, assisting anyone planning or running a community network, was added soon thereafter. They appear as follows on the Gopher:

Scalable Network Access: LANs to CableTV to Internet
1. The Glenview Model: Overview.
2. The Glenview Model: Community Networking via Broadband Cable (Mundt. . .

Idea Exchange References
1. National Education Commission on Time & Learning-Prisoners of Time/
2. The Morino documents (from TENET)/

Initial Observations
After an initial flurry of activity, exchanges stopped. The preparation for this Tel•Ed panel will revive the discussion, but it is impossible to predict whether sharing of proposal ideas will follow the example of the National Center for Technology Planning, run by Dr. Larry Anderson with such success. Despite the fact that proposal ideas are not as interchangeable as sheet music (one organization can't necessarily play another's tunes) and that the track record of *doing* counts as much or more than well-crafted prose, the "us against them" mentality between funded and yet-to-be-funded groups may be emerging to stifle such discussion.

Although we have entered an age in which ideas can represent power, we remain in a "barter" economy with respect to these ideas. Perhaps the evolution of IEUs (Information Exchange Units) will permit the users to quantify the utility of different types of information for various purposes and introduce another paradigm of renumeration, beyond a mirror of the industrial economy we are leaving behind. In this way, information creators, providers, and consumers, the role of two-way communication inherent in the most productive of Internet transactions will be viable for the large numbers of people not yet on the Net, with whom we will collectively shape a future. The panelists are as curious as anyone to see what happens.

Panel
Government On-line

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Abstract

Among the wealth of information that is available on the Internet, there are documents, information, and materials provided by the federal government. This presentation will show participants an array of resources available at government Gopher, FTP, and World Wide Web sites.

We will visit the White House Home Page, an interactive handbook that lets people view electronic photo albums, such as virtual tours of the White House; allows people to send electronic mail to the resident and vice president; indexes all White House publications; and allows users to link to all on-line resources made available by government agencies, such as the Department of Education.

We will visit the Department of Education's on-line services, which provide access to its collection of education-related information which includes funding opportunities, calendars, research findings, and full-text publications, such as A Teacher's Guide to the U.S. Department of Education, A Researcher's Guide to the U.S. Department of Education, and Goals 2000 and School-to-Work *documents. This presentation will demonstrate what resources are available through the department's World Wide Web, Gopher, and FTP services and how easy it is for you to find them on-line.*

Special Project
The Primary Connections Project

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Key words: telecommunications, teacher preparation, district/college partnerships

Abstract

The primary connections project utilizes telecommunications and Apple Remote Access as a backbone for connections made between College Misericordia's education classes and elementary classes in area school districts. In the project's pilot semester, substitutes were provided for elementary teachers who then worked at the college with faculty and students. The connection fostered the development of integrated units in mathematics, science, and social studies. Units were implemented by posting projects, activities, and information on a network for retrieval by elementary classrooms. Elementary classroom teachers used the information posted on the network to facilitate the instructional process. Students engaged in the activities found on the network and then posted their results for review by college students. Preservice teachers assessed student performance and provided feedback. The two-way dialogue continued throughout the semester. The culminating activity of the project provided college students with the opportunity to present a lesson in their assigned elementary classroom.

The project was very successful in addressing the needs that college faculty had identified. Specifically, the needs included: a closer association between methods classes and elementary classes, actual assessment experiences for preservice teachers, and the need to align college

programs more closely with educational reforms through a collaborative partnership. In addition to meeting these college-based goals, other positive outcomes were realized. Faculty and students from kindergarten through higher education were able to develop the technical skills necessary to conduct research and data analysis. Elementary classroom teachers indicated that they gained significant insights into alternative instructional techniques as a result of their interactions with faculty members who have had the opportunity to keep abreast of educational research. Students at the elementary level were highly motivated, and outcomes measured by both preservice and inservice teachers were quite successful. The positive results yielded from the pilot semester have prompted education faculty to expand the project to include more elementary classes. The success of the project has also helped to secure support funding from the Dwight D. Eisenhower Post Secondary Grant program. Hardware and software will be modified to allow greater numbers of faculty and students to access the network.

Programs that are mutually beneficial to higher education and K-12 districts can only serve to improve the instructional environment at all levels. Telecommunications has provided an ideal vehicle to make these partnerships a reality. Distance no longer stands as a barrier to preservice inservice integration. As communications technologies continue to improve, a seamless environment will exist in which preservice training and inservice staff development will combine to produce exceptional teaching/learning environments.

Special Project
Growing Mushrooms with Computers and Telecommunications

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Key words: preservice teacher education, telecommunications, computers, problem-centered curriculum, interdisciplinary strategies

Abstract

The purpose of this project was to provide an innovative method of training preservice secondary teachers to use telecommunications and computer technology in an interdisciplinary, problem-centered curriculum.

Three classes of preservice secondary teachers were involved: two of the classes were Social Studies/Language Arts content; the third class was Math/Science content. The three classes were structured around a problem—writing bills to govern the growth of robotics, bioengineering, and telecommunications piracy/privacy in a new galactic colony. The students in each class chose Political Action Committee work groups in which they were either to research the ethical dilemma (Math/Science) or to write an appropriate bill (Language Arts/Social Studies) to be voted on by the Intergalactic Congress.

The students in all three classes opened telecommunications accounts the first day, and used e-mail, Vax Notes, and phone to exchange information, ideas, and gossip within and between the classes throughout the course of the semester.

The Math/Science consultants were hired by the Language Arts/Social Studies lawmakers. The task of the "consultants" was to provide scientific data to the "lawmakers" about the following issues: Piracy/Privacy in Telecommunications, Genetics, Robotics and Artificial Intelligence, and Nuclear Energy. The Language Arts/Social Studies groups designed and created surveys based on the ethical concerns found by the research consultants. After the surveys were completed by all "constituents," the data were then compiled, graphed, and summarized by the Math/Science consultants. The graphs and summaries were used by the "lawmakers" to write the bills which were presented and voted on by The Intergalactic Congress.

By "being" research consultants and lawmakers, students experienced the political processes in the creation and passing of a bill. In addition, students used telecommunications as an integral part of the classroom experience. Computer technology played a seamless role throughout the curriculum: students used computers for tasks ranging from word processing to graphics to on-line communication.

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Hardware/Network Issues

Updating Tools for Good Governance: Putting School Boards On-Line

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Key words: e-mail, telecommunications, TENET, newsgroups, database, training, school boards

Abstract

The Texas Association of School Boards has implemented an aggressive campaign to educate its 7,500-plus local school board members on the opportunities available —to them as board members and to the classrooms in their districts— through telecommunications. An extensive legislative database, eighteen newsgroups, training sessions, and publications all figure into this unique effort.

Background

The Texas Association of School Boards (TASB) is a nonprofit membership organization dedicated to providing visionary leadership to Texas school boards and to supporting, through quality services, their pursuit of educational excellence for each student.

TASB is a voluntary association established 45 years ago to serve local Texas school districts. Its members include all 1,051 Texas school districts and county school boards, 42 junior colleges, 54 tax appraisal districts, 52 cooperatives, and all 20 regional education service centers. School board members are the largest group of publicly elected officials in the state. The districts they represent have a combined annual budget of $15 billion and employ more than 400,000 people.

TASB began its electronic communications efforts in 1983 with the establishment of TASBNET, a network designed specifically for Texas school board members. In 1986, TASBNET became a part of GTE's Electric Pages.

In 1991, when the Texas Education Agency established TENET, the Texas Education Network, TASB moved its telecommunications activities to TENET and stepped up its campaign to educate local board members on the opportunities available —to them as board members and to the classrooms in their districts —through telecommunication.

Current efforts

The association maintains eighteen newsgroups, as well as a database of all education-related legislation being considered by the Texas Legislature. This information is designed for board members but is shared with all 32,000 TENET users. The newsgroups include information about educational issues, training activities sponsored by the association, and actions taken by legislative and regulatory entities.

For the past two years, TENET e-mail has been the communications medium of choice for the Leadership TASB program, an advanced training opportunity for board members. The Leadership TASB teams, composed of three to six board members from various parts of the state, use TENET to exchange ideas and advance progress on their year-long projects between meetings.

Teacher Education

Bringing the Information Highway into Classrooms: Issues for Teacher Educators

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Key words: teacher education, telecommunications, staff development

Abstract

This session will explore efforts at two universities to prepare teachers to integrate telecommunications into their K-12 classrooms. It will include a description of the goals and learning activities in current course offerings as well as a discussion of implementation issues and recommendations for future directions. It is our intention in this session to critically "compare notes" concerning what is working and what should be the next steps to promote telecommunications for teachers. While the presentation will focus on efforts at colleges of education, it will also apply to inservice providers at the school and district level.

Remote/Distance Education

Innovative Rural Projects: Local Heroes and Two-Way Interactive Video

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Key words: telecommunications, distance education

Abstract

Some community leaders in rural areas have begun to investigate and implement the application of new technologies to education and community services as a means to offer a sound education for their children, as well as to ensure the viability and survival of their community. These individuals are described herein as local heroes. During the formative stages of implementation, the need and subsequent vision to meet the need was usually communicated by an individual or group of individuals within the community who had an extraordinary grasp of the problem and a relentless tenacity in resolving it. These local heroes came from the educational arena, the business community, and the community at large.

This presentation will bring together representatives from various projects in the Southwest to discuss their experiences in implementing two-way interactive video in their school districts and communities. They will also see the videotape Local Heroes, *which depicts the implementation and use of two-way interactive video systems in selected school districts. The following paper will give an overview of the telecommunications technology, two-way interactive video, the rural school districts and communities implementing this technology, and some findings derived from studying these projects.*

Two-Way Interactive Video

Many communities, particularly small rural communities and school districts, frequently lack the technical expertise and financial resources needed to implement advanced telecommunications technologies. Some school districts, however, championed by their local heroes, have mobilized their communities to overcome these technical and financial hurdles and implement alternative learning environments. As new technologies continue a nearly exponential evolution and costs continue to decline, high-tech accessibility to schools and attendant communities can be expected to increase dramatically. One of many advanced telecommunications systems, two-way full motion interactive video and audio is particularly applicable to education and community needs.

In essence, two-way interactive video and audio can network schools, colleges and/or service centers, giving them the capability to transmit and receive live programming. This capability is particularly relevant where populations are sparse and expertise limited. Two-way video enables the classroom or community service center, such as a health clinic, to transmit and receive images and sound similar in quality to those found on professionally produced commercial television. Used creatively, this technology can assist in the revitalization of communities struggling for survival.

Two-way full motion interactive video and audio technology has specific characteristics that make it attractive and feasible for education and community service. These include:

- ***Continuous interactivity.*** In contrast to education by satellite, which typically originates at a great distance and has limited opportunity for student participation, two-way video and audio allows constant interaction between students and teachers who are usually located in the same or nearby communities. This immediacy of feedback allows students who have limited attention spans to maintain active contact.

- ***Relevance.*** Two-way interactive video generally involves the clustering of several small student populations with a teacher at one of the locations, which allows teaching to be specially designed to meet the needs of the students involved. The most common configuration among sites studied was one teacher in a classroom simultaneously delivering instruction to three additional classrooms, usually separated by less than forty miles. One site had a unique team-teaching configuration involving a pre-algebra class. The course was taught by a certified teacher on the premises, assisted by a university professor who was linked through the technology.

- ***Stimulating Learning Environment.*** Two-way video enables the teacher to present a variety of perspectives and images using multiple cameras at different angles and variable fields of view, videotape, and computer display. Images and sound are close in quality to those found on professionally produced commercial television. Such credible imagery, with the additional stimulation of multiple visual and aural fields and complemented with continuous student feedback, has the potential to engage students, including those with learning disabilities, in ways that go beyond typical classroom methodology.

- ***Flexibility.*** Linkage among schools and connection with institutions of higher learning afford the possibility of shaping curricula to meet educational and community needs. Already in practice are team teaching, dual-enrollment courses, availability of specialized experts, monitoring field experiences of student teachers, and the documentation of exemplary teaching practices.

- ***Affordable Cost.*** With dramatic advances in media technology and use of consumer-oriented video and audio production equipment, school districts can equip classrooms (media centers) at a moderate cost. This paper will briefly describe the classroom equipment necessary to purchase and maintain a teacher/student-operated electronic environment.

- *Telephone Company or Cooperative Participation.* There are increasing incentives in the form of grants, profit opportunities, public relations, and deregulation to motivate telephone businesses, particularly small, local entities serving small populations, to be major participants in making two-way video available in schools. In addition, larger telephone companies, including the Regional Bell Operating Companies (REBOC's), are beginning to support two-way interactive initiatives.

- ***Access to Information.*** Once linked with two-way video, a classroom has the potential to receive other information available within the network. Once equipped, information from videos, laser discs, satellite feeds, and computer networks can all be easily transferred from one classroom to another.

- ***School/Community Production Center.*** Originally, television was viewed merely as a means to chronicle live news events. It has become much more. So, too, the electronic classroom has the potential to exceed its original expectations. In essence, each classroom equipped with two-way video becomes a fully functioning television studio, complete with a capacity for a studio audience, that can "go live" to other schools and/or be recorded for videotape distribution. Once a two-way video system is in place, linkage into distribution modes such as community cable systems becomes relatively affordable, creating the potential for shared community meetings, guest lecturers for the school/community, adult education, live school news production, dramatic presentations, and more. A typical quote from system advocates was, "The uses of two-way interactive television are limited only by the extent of our imagination."

The typical classroom is equipped with three video cameras: an overhead camera that can display teacher and student work, and serve as an electronic chalkboard or overhead projector a camera on the teacher (when present) and a camera on the class.

All cameras can be manipulated to cover varying fields of view. For example, a camera can change from wide coverage of the classroom to a close-up of an individual student. Generally, the field of view can be controlled electronically from the teacher's desk using a multiple-source control panel, although in some instances cameras have to be adjusted manually. The control panel also enables the teacher or student to switch from one camera to another, depending on which of the three cameras he or she wants to be accessible for network distribution. The control panel can also activate other multimedia devices such as video feeds from satellite down links, computers, CD-ROMs, laser disc players, and VCRs.

Two banks of three to five TV monitors are situated to provide students and teacher visual access to other classrooms in the cluster, as well as the electronic chalkboard. Monitors for students to watch are usually located at the front of the room and for teachers in the center or rear of the room. Both banks of monitors display the same images. One monitor shows the teacher or the image selected by the teacher using the multiple source control panel. The other monitors display the students at remote sites. The difference between the teaching classroom and the remote classrooms is that the students in the teaching classroom see and hear the teacher both on video and live.

Audio is captured by placement of multiple microphones throughout the classroom and an attached lavaliere microphone worn by the teacher. In newer systems, wireless lavalieres are used to allow the teacher more freedom of movement. On the horizon are camera housings that can actually follow the teacher as she/he moves about the classroom. Each class is usually equipped with a fax to distribute materials and assignments. Frequently, a teacher or staff member living in a neighboring community physically transports materials to a linked school while commuting to and from school.

All video cabling within the classroom and school is coaxial (like the cable that runs between a television set and a VCR), carrying a conventional analog signal at the site. Transmission between the sites studied is digital, by means of fiber-optic cable. The video and audio signals generated by classroom cameras and microphones are routed to a control console and split, one set of signals routed to the originating classroom and the other converted to digital information for transmission to other classrooms by fiber-optic cable.

Cost categories for full implementation vary but basically include:

- ***The original installation of cable*** can include the cost of the fiber-optic cable, installation of the cable, securing rights-of-way, and bringing fiber-optic to the school door. These costs have often been absorbed by local telephone companies or cooperatives. Generally, participating telephone companies or cooperatives have been willing to connect schools to their fiber-optic cable when schools were located near existing or planned fiber-optic lines. On occasion, local telephone companies or cooperatives and their subsidiaries have been willing to extend lines substantial distances to connect educational entities, sometimes to the point of paralleling existing cable laid by non participating telephone companies. Local telephone companies or cooperatives hope to recover costs by also making fiber-optic cable available to government entities, local businesses, medical facilities, and other commercial carriers. As one consultant for a small telephone cooperative put it, "We tend to go wherever the big boys don't want to."

- ***Installation and maintenance of telecommunications equipment*** that converts the analog video and audio signals generated by the studio classroom to digital. Components for each site are a coder/decoder (codec), transmitter, and transformer. Typically, the telephone company or cooperative underwrites this expense initially, with the expectation of being reimbursed at a later date. Some telephone companies or cooperatives have worked out five-year payback plans with participating school districts. Costs range from $10,000 to $30,000.

- ***The cost of classroom studio equipment*** is typically borne by each participating school, although some motivated telephone companies or cooperatives have been willing to assume this cost in order to facilitate implementation. Generally, the cost to equip an existing classroom is between $20,000 and $28,000. Typically, one classroom is equipped in each participating school.

- ***Line usage fees.*** All telephone companies or cooperatives expect to be reimbursed for the use and maintenance of their fiber-optic lines and auxiliary equipment. The cost is negotiable, and, once again, some motivated telephone companies or cooperatives will defer costs to facilitate implementation. Generally speaking, annual costs being quoted are somewhere between $15,000 and $25,000 per school, although the maintenance and use fees of two of the three networks cited in this study are atypical, one being half of the above amount and one still enjoying free access and maintenance. Whether free access for the latter will continue remains undetermined.

The Sites

Below are descriptions of three two-way, full motion video and audio projects in New Mexico, Oklahoma, and Texas that are in varying stages of maturity, having been on-line from two to five years. These projects were chosen because each has unique characteristics that demonstrate various aspects of the two-way interactive video process, and they are among the few such projects in full operation in the Southwest. They have been visited by many other educational entities interested in considering this technology. All schools in the project were considered at risk because they were not able to provide education comparable to that of larger, less-isolated schools.

Sites were selected from the southwestern states of New Mexico, Oklahoma, and Texas, all hit hard by economic setbacks in the oil and/or agricultural industries. Sites had little if any governmental funding at national, state, or local level for implementation of innovative technologies. The projects were conceived and funded (at least in the pilot phase) from within the community, primarily from nongovernmental sources.

The partnership between local schools and indigenous private businesses provides a unique perspective in terms of the implementation of innovative technologies in education. These "grass-roots" initiatives contrast with projects in Wisconsin, Minnesota, Kansas, Iowa, and Mississippi that received a significant portion of their funding from such public sources as tax bonds, state departments of education, and/or district funding.

The Oklahoma Panhandle Shar-Ed Video Network (PSVN)

This project is the most mature network, having come on-line at the beginning of the 1988–89 school year to link four schools in one county. Although the current configuration of the Shar-Ed Network involves 12 schools and one regional university across a three-county area, the original initiative involved only the four schools in Beaver County, the easternmost county in the Panhandle. Generally, the trend among projects studied was to start with a cluster of schools and then expand as a project developed.

History

Initiatives for Beaver County began in 1985 in response to funding cutbacks as a result of declining tax revenues, coupled with state mandates to provide additional courses. The four county superintendents attended a demonstration in rural, western Wisconsin relating to interactive television distributed by microwave. Two of the superintendents were impressed by the interactive nature of the system and the students' ability to accept the technology and respond to teachers as if both teachers and students were in the same room. Their first selling job was persuading the other two superintendents to join the quest. The result was the formation of the Beaver County Interactive TV Cooperative.

Upon returning from Wisconsin, the Beaver county superintendents reasoned, "If they can do it, why can't we?" and began the long odyssey of getting support and funding for the implementation of two-way interactive video in their county. Originally, a distribution system involving microwave technology and modeled after the Wisconsin project had been planned. Months of knocking on doors, meetings, presentations, and grant writing ensued. Some efforts were successful, others less so. Money began to trickle in from limited state assistance and grants, but not nearly enough to fund the project. Engineer reports indicated that microwave technology might not be feasible for Beaver County.

The superintendents kept knocking on doors. Fiber-optic cable was beginning to be installed by phone companies and was being heralded as a revolution in the field of communications. A Beaver County school board member was also a board member of the local telephone cooperative, a rural cooperative that provides telephone service to the Panhandle and surrounding areas. He suggested approaching the local telephone cooperative for the following reasons:

- The local cooperative, although relatively small, was progressive and had been installing fiber-optic cable in the area, as well as upgrading many of its other services.

- The cooperative, operating under federal guidelines, was required to reinvest profits into the community or to issue capital credit funds to customer-members. Supplying the schools with interactive television made sense, because fiber-optic lines could be used to carry signals other than those necessary to link the schools.

- The cooperative had a vested interest in the survival of the schools because it believed that the school was essential to the survival of the community and that without the community its subscriber base would dissipate.

The relationship between the Beaver County educators and the local telephone cooperative proved to be fruitful; meetings ensued and an accord was reached. The local telephone cooperative, serving the three-county area of the Oklahoma Panhandle, wanted to provide the same educational opportunity to schools in Texas and Cimarron counties that wished to participate. However, it was agreed that for the first phase, the local telephone cooperative would connect the four schools in Beaver County with 52 miles of fiber-optic cable and provide maintenance, transmitting equipment, and transmission access.

The Beaver County ITV Cooperative, through its accumulation of grant monies, would partially reimburse the local telephone cooperative over a five-year period at the rate of $45,000 per year ($11,250 per school district) and would cover the costs of furnishing media labs with cameras, TV monitors, microphones, etc., in the four schools, at about $20,000 per lab As of 1993 that obligation was satisfied, and now each school in the network is paying the local telephone cooperative $7,000 per year for maintenance and transmission access.

In addition to reaching an accord with the local telephone cooperative, Beaver County schools had to reach agreement among themselves in terms of aligning class schedules and calendars. This turned out to be one of the more difficult obstacles to overcome. In order for schedules to match precisely, school days had to begin and end at the same time. Class periods and school calendar had to be aligned. This "electronic consolidation" ran counter to the independent nature of the Panhandle superintendents and school boards. However, with a lot of "hair pulling," concessions, and cajoling, a unified schedule was hammered out that would allow courses to be taught over the interactive system.

Courses began to be exchanged over the Beaver County two-way ITV network in fall 1988. Advanced Placement (AP) English, Spanish, art, and accounting were offered. Classes originated from different schools, and few glitches were encountered. The telephone cooperative's installation of the complex system functioned well from the outset. Instructors selected to teach the ITV classes were among the best in the county and were enthusiastic about teaching over the network.

Other teachers expressed strong reservations, fearing that the sharing of teachers might phase out teaching positions. Training was minimal, generally limited to familiarizing the teacher with equipment operation. Very little information about teaching on two-way interactive video was available. Teachers who gained experience on this network have subsequently helped to train and advise educators implementing other networks. Continued exposure to the technology reduced apprehension among faculty, particularly when it was perceived that the technology would not replace teachers, but rather would make courses available that the existing faculty could not provide because of lack of training or low enrollment.

During 1990–91 three schools in Texas County, Beaver's western neighbor, were added to the network to form a second cluster. The cost to connect to the network was $17,000. These schools shared their own classes, including AP English, Spanish, general psychology, and advanced mathematics. At this time there was no sharing between the two clusters because of technical limitations and the full schedule of the Beaver cluster.

Beginning in January 1991, the network offered its first course from an institution of higher learning, a graduate class in educational administration from Northwestern Oklahoma State University. A regional university located in Texas county came on-line in summer 1991 to offer college courses in English, history, economics, sociology, and government to qualifying high school students (seniors with a 3.0 or better grade point average), as well as to adults in the evening. The courses offered to students during school hours are *dual enrollment* or *concurrent enrollment* courses, in which passing students receive both college and high school credit, and these courses are available in all three counties. The university has the potential to interact with all 12 schools at the same time. This could prove difficult, except that class sizes tend to be small, the largest number of students at any one location being seven and the largest number of schools taking a given course being seven.

During 1991–92, two more schools were added in Texas County, making a total of five in that cluster. Three schools in Cimarron County, just west of Texas County, formed a third cluster in 1991. This cluster offers a nearly full schedule on the network, including mechanical drawing, trigonometry/calculus, AP English, Spanish, and speech from within the cluster; art from the Texas County cluster; and economics, a dual-enrollment course, from the regional university.

By the 1992–93 school year, all schools in the three counties of the Panhandle that wished to participate so were connected to the network. Tri-county schools then concentrated on upgrading teaching of existing courses. Sharing of courses among clusters has increased somewhat, but school networking patterns have essentially stabilized. Community access has been expanded in the form of noncredit courses, paraprofessional training, and intercommunity meeting opportunities during nonschool hours.

Although local educators are satisfied with the network, they feel that it would be better used if a professional were assigned to manage it. Expectations are that the coordinator will also improve the use of the system by planning and implementing inservice activities for teachers, providing training for users, expanding community and business participation, promoting the system, writing grants, and advising PSVN members regarding potential enhancement of the network.

All administrators interviewed feel that the current use of the network is successful. However, they also feel that such an innovative tool can be more creatively used, and they expect that the addition of a coordinator will result in improved usage.

Plans for the network include:

- Connecting with Oklahoma State University and/or the University of Oklahoma (currently some graduate courses are being taught by Northwestern Oklahoma State University, but the instructor teaches from one of the Beaver County schools, and no fiber-optic link has been made with the university)

- Offering foreign language awareness courses at the elementary school level

- Offering vocational training courses in Cimarron County

- Providing computer data transmission, including student access to Internet, and computer training from Panhandle State University

- Expanding community participation

The Eastern New Mexico Instructional Television Consortium (ENMITC)

ENMITC came on-line for the 1990–91 school year. Although inspired by the Oklahoma Panhandle Shar-Ed Network, it evolved quite differently. Rather than originating from educators, the vision and implementation came from the manager/CEO and the board members of a rural telephone cooperative whose service area covered 2,500 square miles in eastern New Mexico and western Texas.

That original vision included:

- linking together twenty schools in New Mexico and Texas

- providing access to medical training and technical support from the Lubbock Health Sciences Center to community health facilities

- making on-site training available to outlying industries

- delivering university courses and professional training for community members

The local telephone cooperative's position was a pragmatic one. It was convinced that the viability of the rural school was essential to the survival of the surrounding population, who made up the cooperative's subscription base.

The cooperative approached schools that were already accessible by fiber-optics and offered them the opportunity to participate in a pilot project. Under the pilot agreement, the local telephone cooperative assumed all costs for setting up the network, including installation of production gear for studio classrooms. The cooperative sought support from the state legislature but was unsuccessful. The only governmental support available was an interest-free loan from the Rural Electrification Administration (REA). Rather than wait for additional monies to be allocated, the local telephone cooperative decided to establish a successful program and then petition the state legislature for reimbursement. The obligation of the schools would be to coordinate schedules and classes so that the system could be used effectively. Unfortunately, Texas schools in the cooperative's serving area were unable to participate with New Mexico schools because of the differences in educational requirements in the two states. Texas schools would still like to participate, but bureaucratic problems remain.

The telephone cooperative has been partially compensated by the state for the network installation. In 1991, the legislature appropriated $140,000 to two network schools for implementation costs, and in 1992 it appropriated $300,000 for implementation costs at five other network schools. However, it is unlikely that the telephone cooperative will make any further large-scale investment unless the state and/or school districts agree to support the initiative up front. Company officials state that only one other school is slated for network access in the near future, which will bring the number of participating schools to ten. At present, the network has the capability of reaching over 22,000 inhabitants who are sparsely scattered throughout the eastern plains of New Mexico.

History

Two clusters of networked schools were conceived, both in eastern New Mexico. One cluster linked schools that had classes five days a week. The other cluster held classes four days a week. The three schools that formed the five-days-a-week cluster spanned a distance of nearly 200 miles. Because of disparate curriculum needs, participating schools were able to share only courses in art and Spanish. This lack of shared course offerings made it difficult to take full advantage of the network.

The second cluster, with only two four-day schools participating, shared art, physics, geometry, Spanish, and algebra. A major problem occurred because one school was closed on Friday and the other was closed on Monday. The schools could not agree to be closed on the same day, so each had automated taping facilities that recorded classes transmitted on the day they were closed. Although both clusters had less than an ideal beginning, the project was deemed successful and attracted a lot of attention.

The 1991–92 school year witnessed the consolidation of one cluster and the weakening of the other. The five-day cluster lost one of its schools when it converted to a four-day week and joined the other cluster, leaving only two five-day schools at the extreme ends of the network, with only one shared class between them. The four-day cluster added yet another school, resulting in a total membership of four. All schools within the cluster agreed to a Monday–Thursday week, eliminating the necessity for students to attend one day of taped classes. Each school supplied one course, with a network schedule including physics, algebra, Spanish, Southwestern literature, and art appreciation.

A local community college also joined the network during the 1991–92 school year after being invited to do so by the manager/CEO of the local telephone cooperative, with all costs to the college being waived for one year. The college was able to offer a number of dual-enrollment courses to qualifying high school students, including psychology, sociology, algebra, English, Spanish, and art appreciation. These courses were particularly attractive to college-bound students, typically 40–60 percent of the school population, because courses were offered without cost to the students and textbooks were provided. With this program some students have been able to accumulate as many as 24 hours of college credit before graduating from high school.

The 1992–93 school year saw the increased role of the community college in the network. Two schools in the four-day cluster were unable to contribute courses to the network because of faculty changes. The community college was in a position to increase its participation and did so by offering dual-enrollment courses to high school students over the interactive network.

Some school superintendents expressed a preference for courses offered by the college because of the dual-enrollment advantages and felt that the accelerated pace of the college-level courses worked well with a television format. The community college offers a full day, four-day-a-week schedule of concurrent enrollment classes. These courses have become so popular that network schools are presently competing for them, with some schools being left out. It is expected that this problem will be alleviated when the second ITV classroom at the community college is completed.

The community college offers 15 hours of college-level courses in the evening for community members, with as many as 31 students enrolled at a given school. Courses offered include introduction to business, principles of finance, accounting, art appreciation, English composition, American government, sociology, psychology, agricultural marketing, infant and toddler care, New Mexico history, and psychology. In response to local requests, banking and criminal justice are being offered for the fall 1993 semester.

The community college is also providing studio space to the New Mexico Department of Labor, which uses the system during off-hours to provide information and client intake services to community residents linked over the network. Also, the community college is providing studio space for graduate-level education courses being taught by faculty from a regional university. Some schools in the network have more than 50 percent of their teachers taking courses. Additional uses under consideration include client services by the New Mexico Department of Human Services and inservice education for personnel of the participating school districts. The community college is also writing a grant to upgrade its network facilities in order to expand course offerings and has already approved a budget for a technology and training center that will include a new ITV center with two studio/classrooms.

The original vision of the manager/CEO of the local telephone cooperative has been scaled back for the time being. The cooperative had planned to put as many as twenty schools on the network, and a number of schools have petitioned the local telephone cooperative for network access.

The TeleCommUNITY Network

Located in a small Central Texas town, this project began operations in January 1992. Although TeleCommUNITY Network came on-line recently, it was the first fully functioning two-way video and audio network in Texas K-12 schools. This project has perhaps the strongest community focus among projects studied in that the first phase of implementation occurred exclusively within one community. Participants are the local school district— specifically the high school; a regional university; the local independent telephone company; and the second largest Job Corps center in the country, which is located on the outskirts of town.

History

The initial vision came from an assistant superintendent and a school psychologist who were strong advocates of educational technologies. The regional university located in the community became an enthusiastic advocate. Support quickly followed from the local telephone company, who hired the school psychologist and a two-way interactive TV specialist to facilitate the program. This is the only instance among the projects studied in which professional facilitators were brought in to develop and coordinate activities. The telephone company also financed the installation of the technical network, including classroom equipment. The three on-line pilot sites agreed to partial reimbursement of the telephone company over a five-year period.

TeleCommUNITY, with a 14-member planning team, started meeting in January 1990 and implemented its network in January 1992, linking three sites in the community. Through a series of grants, support from the telephone company and university, and a lot of legwork by all involved, TeleCommUNITY began a unique program called Partnerships for Access to Higher Mathematics (PATH Mathematics), a two-year partnership that was funded by the Department of Education to conduct research on mathematics teaching and learning and research in social services.

In addition to the PATH Mathematics project, the university is offering dual-enrollment calculus to high school and Job Corps students over the network. The Job Corps is offering specialized vocational training to high school students and residents of the community. Scheduled courses for the upcoming semesters include Russian, Japanese, and college English.

Also active on the network are two programs that address the needs of adult learners. The first is called the World of Work (WOW) program, in which adults, including Job Corps students and community members, study literacy and job initiative strategies. The classes are delivered over ITV from the site at the Job Corps. Instructors and tutors are present at each site that is on-line.

Another major project is the Southwest Texas Center for Professional Development in Technology (SWT-CPDT). Currently funded with a $1.1 million grant from the state education agency, the center offers instruction to inservice classroom teachers in methods and techniques for using technologies in education. SWT-CPDT is concentrating on advanced applications of digital fiber-optics, including extensive integration of the Internet in elementary classrooms and creative uses of interactive multimedia networks and workstations.

Other plans are as follows:

- to expand the network to outlying areas in adjoining counties, as well as within the community
- to construct additional classroom sites at the school district and university, featuring fully interactive video, audio, and data capabilities that will interface with other on-line class labs
- to support activities, including on-line computing and video, for children and adults of family literacy projects
- to connect with an ITV network that is developing in a nearby metropolitan area
- to add other sites to the community network, including a church, a library, a resort conference center, and a local detention center for drug offenders, in order to offer wider disbursement of adult education programs.

The Path Mathematics Project

PATH Mathematics was designed by two professors at the university, P. A. Kennedy, & N. F. Chavkin, one in mathematics and the other in social work, in collaboration with teachers at the area high school. The curriculum combines innovative teaching techniques focused on higher-order mathematics with a social support strategy that combines a dedicated PATH social worker, university social work interns, and other assistive elements of the community to help students cope with nonacademic pressures. The course was team-taught by the above mentioned university mathematics professor, located at the university and linked over the network, and a school district mathematics teacher who was on the premises. More than 80 percent of the students passed the course. Students' progress will be monitored as they continue with mathematics and other studies.

The PATH project used the technology primarily as a vehicle for field-testing and revising curriculum. The designers of the curriculum participated in the teaching process, using two-way interactive video to monitor the effectiveness of teaching and social service strategies. This use of the technology is radically different from uses in other projects mentioned in which teachers are shared by schools within a network cluster.

In the second year of operation, PATH Math continued as a regular course offering, with the university/school district team teaching model still in place. By the completion of the 1992–93 school year, more than 200 students had successfully completed the requirements of the Path Math curriculum.

Conclusion

Full motion, two-way interactive video and audio is a networking of media production and reception points — schools, community colleges, and/or universities — that have the technological capability for transmission and reception. This capability is particularly relevant to small rural schools where populations are typically sparse and human resources are severely limited.

Until recently, the costs of implementing two-way video have precluded diffusion on a large scale; however, new policy incentives and the dramatic increase in telecommunications innovation, concurrent with decreasing technology costs, the aggressive expansion of fiber-optic telecommunications lines, and collaborative efforts between private industry and progressive educational entities have made it possible for districts with extremely limited resources to plan and implement an effective two-way electronic education environment.

Below are findings and recommendations derived from the research.

Startup

A major concern or need driving the acquisition of a two-way interactive television system in the school environment was increased curriculum demands stemming from various state-level initiatives and more rigorous college entrance requirements. Repeated emphasis was placed on the precise articulation of the need, rather than some amorphous excitement about the "potential" of the technology. In order for the implementation of the technology to succeed, there has to be a well-defined need or set of circumstances for the technology to address. This specificity can also have a downside, in that once the original objective has been met, there may be little motivation to explore further potential.

Another need, perhaps more fundamental, was the desire to provide the best possible education for the children of the community ar·' " nd bring them into the twenty-first century." Needs were initially felt and identified by local school district personnel. Typically a "local hero" emerged — an individual who was involved in some way in the identification of the need. This person became the champion of the cause, driving the adoption and implementation processes. Ironically, in some instances champions were only tangentially affected by the technology once it was in place. Their commitment stemmed from their passion and belief in the potential of the technology for the common good. As one initially reluctant superintendent put it, "Altruism was rampant."

There were degrees of commitment among participants, but among the primary initiators, commitment went well beyond professional expectations. One visionary referred to herself as a "monomaniac on a mission."

In almost all locations studied, communities suffered from a dearth of physical resources, funding, space, and a number of regulations and scheduling problems that were obstacles to the implementation of the technology. However, the school and community cultures were benevolent, allowing for an environment of innovation and risk-taking.

Implementation

All programs studied required extensive planning, from linkage of participating entities, to acquisition and installation of the technology in classrooms, to scheduling, to training teachers, to preparing students. The nature of the interactive process mandates a precise planning procedure, which also organized and improved teaching efforts in many cases. Adequate planning that made the technology work from the onset, resulting in the technology's becoming a matter of course, was also a major factor in overcoming resistance to implementation.

Most participating local school district administrators were highly supportive of the technology and of the entire technology implementation process. Some administrators were apprehensive at first, but generally became advocates when the technology was implemented. ....

In order to accommodate the introduction of the technology, adjustments to rules, regulations, and school policies were necessary at both the state and the local levels. More coordination and flexibility in terms of federal and state regulations are necessary to accommodate new communications technologies. Without adjustments, widespread use of networked technologies will not occur.

Staff development is very important to the success of implementation. Delivery over the technology is substantially different from conventional classroom teaching. Good classroom teachers tended to make good network teachers, but training is essential and often not adequately provided. Teachers using the system are usually given more preparation time but are not trained to maximize the system. Conferences involving interactive teachers should be developed to share information and design models for future possibilities.

Distribution of materials is still problematic. Fax machines are present in all classrooms, but when large quantities of materials have to be sent, the fax is inadequate. Transfer of information by computer would be much more efficient and is possible through the technology. Interactive computer linkage at present is in the infancy stage at all sites studied.

Funding

Although expensive, the technology is affordable; the effort must however have support from the business community. All projects studied had enthusiastic support from small rural telephone cooperatives or telephone companies, as well as other businesses. The major costs of implementation were originally undertaken by the local telephone company or cooperative, with partial reimbursement occurring over a period of time by the school districts or by state departments of education. Larger telephone companies, although often burdened by restrictions imposed by state and federal utility regulations, are also beginning to get involved.

In most cases preliminary funding through grants, foundations, and interest-free loans provided seed money that engendered credibility and enabled the onset of serious planning, which generally included extensive travel to existing sites. In no cases studied did the monies generated cover all implementation costs.

State and federal support tended to grow as projects matured, and the success of projects became widely known. It was the objective of all participants first to build a credible model, then gain support from state and federal decision makers, and finally encourage the spread of the technology.

Prognosis

Two-way interactive video is alive and growing in the Southwest region. In spite of devastating local economic conditions experienced by many localities in the region, this technology is assisting in the delivery of effective education to small rural schools. Analysis of test scores, course grades, and student surveys, as well as student, teacher, community member, and school district administrator interviews indicate that education delivered over the technology is effective, desirable, and popular. However, as programs mature there seems to be a leveling off of innovation because the needs for which the system was implemented are being met. Mature sites are encouraged to explore new ways to take advantage of the system. Introduction of computer interactivity would be particularly useful.

While all projects started out with specific classroom courses, participants viewed the technology as a community resource. As projects matured, community offerings increased, particularly in the area of adult education. Although the novelty of the program could be a significant element in explaining a project's early success, the most mature program (six years in duration) has grown stronger with time and is currently an integral part of the community, school, and curriculum.

Community members consider the school to be the hub of their community and necessary to the survival of the community. School icons are frequently seen on community property such as water towers, walls, and other large surfaces. Schools are often categorized as the "biggest business in town." Once the technology was understood, community members tended to be supportive. It must be noted, however, that implementation of the technology did not necessarily require additional community resources.

Remote/Distance Education

Plugging In: Linking Schools with Telecommunications

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Abstract

In an effort to preserve the rural American lifestyle, community leaders have begun to consider the application of advanced telecommunications for rural education, human services, business, and local government. New telephone, computer, and video telecommunications technologies can empower rural communities by offering creative ways to provide services comparable to those in urban communities. Telecommunications are being used by rural communities to support and enhance the arts and cultural activities, economic and business development, the legal and justice profession, health and human services, training and education, and a broad spectrum of political, government, community and individual interests. Visionary rural leaders are limited only by their imagination.

An important mission of SEDL's Rural Small Schools Initiative is to identify rural schools and projects serving rural areas that have implemented or are in the process of implementing telecommunications technologies to further their educational objectives. Once the schools have been identified, SEDL then documents (in both print and video) the implementation process, the technology, and the use to which the technology is put.

Five promising school district/projects located in SEDL's service area of Arkansas, Louisiana, New Mexico, Oklahoma, and Texas are briefly described below, and representatives from these projects will be at this presentation to discuss their programs. Also, professional videotaping of each project will be shown at the ISTE presentation.

Intended audiences of this documentation are educators committed to rural, small schools; state departments of education; rural citizenry; educational organizations with a rural focus; teachers' organizations; rural school administrator groups; and telecommunications professionals.

Technology and Interdisciplinary Teaching in Siloam Springs Schools

Siloam Springs Schools is located in a small community nestled in the Ozarks of far northwest Arkansas. Although the district is rural and in a remote area, its far sighted educators are exploring all options to deliver the best possible education to school district children, and technology is an important part of that plan. However, as Dr. Mary Gunter, Siloam Springs' assistant superintendent, points out, "We don't have a technology plan per se. We let our educational needs determine what kind of technology we buy. It's the curriculum first; then we see how technology can enhance the teaching of that curriculum." Technology is used as a means to an end rather than an end itself and never acquired without having a strong need for its use within the curriculum. As part of this philosophy, a major effort has been to get designated technology into the classroom so that it becomes a natural and integrated part of the classroom learning environment.

"Technology is just another component of a larger restructuring effort," says Rick Jones, Siloam Springs technology coordinator. For example, several years ago district administrators and teachers felt that it was important to improve the reading skills of students at the elementary level. After considerable research, decision-makers agreed on the acquisition of computers and IBM's Reading to Read and the Reading to Write software for early grade levels. "We now have at least five computers in all first-to-third grade classrooms in our three elementary schools," says Rick Jones. "Another benefit is that our students start using computers at a very early age. They don't see them as technology, but just a part, usually a fun part, of the learning process."

Installation of computers and software at the elementary level started three years ago, and results were so successful that the district now intends to put computers in all elementary classrooms, doing at least one grade level per year. Further validation of the district's restructuring strategy and implementation of technology is evidenced by the Siloam Springs community allocating a fixed portion ($75, 000 per annum) of the school district's mileage specifically to the acquisition and maintenance of technology.

Additional evidence of success of the use of technology in restructuring efforts is the innovative interdisciplinary learning that is taking place at Siloam Springs High School. Rick Jones states that their school district has "bought into Theodore Sizer's *Coalition of Essential Schools* principles." Using criteria from this perspective and infusing various technologies together into integrated curricula, the high school has four courses/projects that are quite a departure from standard classroom teaching.

Creative Publications began four years ago. A high school business and art teacher collaborated to design and team teach a course whereby students would design and produce print material for local area clients such as Siloam Springs Chamber of Commerce, IBM Eduquest, and the school district itself. Clients come into the classroom to describe their work and proposed project (brochure, logo, business cards, newsletters). Students then design, using computers with graphics design software, produce and print out on color or black and white laser printers, the various interpretations of the desired copy and/or artwork. Students then share the results with clients who make a selection from the existing material or make other suggestions.

Students use a variety of software including Page Maker, Word Perfect, Micrographics Designer, as well as an image scanner to create original artwork and copy. The unique quality of this course is the combining of two different disciplines, art and business, to meet the requirements of a real world situation. In addition to gaining practical experience, students also profit from the interdisciplinary nature of the course. "The combining of art-oriented and business-oriented students tends to make each group more sensitive to the strengths of the other," says Rick Jones. Art students, for example, were sometimes reluctant to consider the computer as an artistic tool. "When they (art students) get on the computer, it doesn't take them long to find out what it can actually do," says Rick Jones. "Then they're sold on it." Business/computer students also benefit from the creative input of the art students. "It's a true synthesis, an interdisciplinary fusion," says Rick Jones.

Project Paradigm is a project-related course that is perhaps the most ambitious of Siloam Springs' interdisciplinary efforts in that it combines four disciplines, language arts, social studies, science, and mathematics. The course has a total of eighty students (twenty per classroom with each class representing a discipline) who share a common class period. Having been assigned a year-long topic based on the essential thought, *Changing Paradigms to Meet the Challenges of the Twenty-First Century*, students decide on issues they wish to address and work in cross-content-area groups throughout the year to study issues and come up with viable solutions. The project culminates at the end of the year with major multimedia presentations involving community, parents, and people having tangible connections to the particular topic(s) being addressed.

Successful topics have been health care, environmental studies, drugs and alcohol, and nutrition. In order to better understand access problems for persons with disabilities, students managed to convince the mayor and business leaders to stay in wheelchairs for an entire day so that they might get a clearer picture of access problems in the community and places of business. The project was so successful that it became a featured new story in neighboring communities, and the city council is actively considering the installation of easier access in several public locations.

In addition to year-end culminating events that use presentation software, video, audio, and other assorted media, students use CD ROM software for research topics, as well as word processing and spreadsheet software for generating charts and graphs, and analyzing data.

Projects are comprised of students from each discipline, and with students located in four classes, the problem of communication has been solved by an interactive local area network (LAN), enab'ing students to share files and talk to each other by E-mail. Students also meet as a large group at regular intervals. Data retrieval and manipulation via software, as well as point to point communication over the LAN readies Siloam Springs students for access to the Internet which should happen sometime this school year.

The two other classes, *Humanities* and *Creative Writing/Drama* involve teaching teams of world history and language arts and English and drama. In both of these classes, technology supports interdisciplinary activities of students. "Technology is important, but it's not the solution to everything. The focus of our strategy is and always will be the kids, what they need and how to give them what they need," says Rick Jones.

Telelearning Project in Louisiana

An initiative funded through the Louisiana Department of Education's Statewide Distance Learning Network grant has been the Telelearning Project at the Louisiana School for Math, Science, and the Arts in Natchitoches. Five years ago the Louisiana Department of Education determined that there was a significant gap in course offerings for college preparation and scholarship qualification, with a total of 140 Louisiana schools, mostly rural, unable to offer appropriate curricula.

Louisiana educators looked to telecommunications technology for the solution. They needed an effective but relatively inexpensive system that could reach into every Louisiana school and allow the constant student-teacher interaction necessary to prepare students for the competitive world of higher education. This statewide commitment to quality education would prove unique in the United States, providing free courses to all Louisiana schools with telephone access. Interactive telecommunications software called Optel Telewriter III and Modem Voice Too, which uses a combination of computers, electronic tablets, and telephones, was chosen for the project.

The Telelearning Project is able to make its courses available to every school in Louisiana that requests them. For school year 1992-93, the Telelearning Project is offering 72 sections of 15 distance learning courses to 1,214 students at 116 schools in 42 districts. The project has 16 full-time telelearning teachers, with courses including Fine Arts Survey, Spanish I-III, French I-III, Physics, Calculus, Advanced Math, Computer Science, Latin I-II, and German I-II.

Classes are purposely kept small so that students can take advantage of the interactive nature of the program. Dr. Richard Lofton, director of the Telelearning Project, says that the maximum number of students in one class is thirty, and typically the number is much smaller, with an average of seventeen students participating from as many as five or six sites throughout the state. Students and teachers are able to communicate by voice, electronic tablet, fax machines, and computer via software and multipoint modem.

Voice communication is facilitated by a voice converter with microphones distributed throughout the class. The constant voice communication afforded by this delivery system allows the teacher, with the assistance of an on-site proctor, to monitor student progress continually. Teachers are also able to generate information on electronic tablets that serve as highly sophisticated chalkboards, and are visible on 27-inch monitors installed in all telelearning classrooms. Each class also has its own tablet so that students can communicate with teachers in a like manner. Communication is further facilitated by computer programs, which are operated by both students and teachers, and fax machines to transmit non-computer-generated information. Teachers use various strategies to personalize the telecommunication process, including posting students' photos during sessions in order to "see" students engaged on-line, exchange videotapes, and correspond with parents.

A Technology Plan for Rural New Mexico: Making Hard Choices
The Cuba Independent School District

The children of the Cuba Independent School District attend three small schools nestled in the Nacimento mountains of northwestern New Mexico. These mostly Hispanic children tend to come from families whose livelihood is eked out from sparse agricultural opportunities in the region. There is little local tax money to support even the most modest educational goals, much less innovative practices that use the latest in advanced telecommunications. However, in spite of this dearth of resources, the school district has become a leader in the implementation of telecommunications and other related educational technologies.

"We're not at that stage where we have a choice in public education about whether we have technology or not," says Joe Lopez, Cuba schools superintendent for seventeen years. "If we're going to give our students the same opportunity to learn that students have in the larger cities, we can't afford *not* to take advantage of the benefits of educational technologies."

Mr. Lopez, with the support of his school board and community, began laying the foundation for a technology plan in 1988. The district started its six-year implementation process during the 1990-91 school year. "We're about halfway through," says Lopez. "We've got a lot of the technology in place; our teachers and students are learning to use the technology and are exploring ways to use it most effectively to support their educational goals."

Immediate access was a key concept in designing the implementation of the technology plan. "If it's not available in the classroom immediately, it's not effective," says Mr. Lopez. Thus, all classrooms in the district have been linked on a local area network that enables classrooms to receive as well as transmit video, audio, and digital data. Each classroom is equipped with a telephone, a large video monitor, and at least one computer. All classrooms will have a minimum of five computers by the end of the six-year implementation plan. Teachers can import all kinds of electronic information, including satellite transmissions, local cable programming. in-house video productions, laser disc programming, CD-ROM information, district-owned software applications, and Internet connectivity.

In addition, each classroom can cable cast live video and audio throughout the district and even to the community at large with the cooperation of the local cable company. This is achieved with a mobile video production cart that can easily be moved to any classroom, quickly set up, and connected to the local area network, and then, if desired, to the local cable system. "When we designed the system," says Sandra Ichold, district librarian and media coordinator, "we wanted to be able to involve the community as well as the teachers and students." The district has a video production class in which students produce videos that are geared to student and community interests, and plans are underway to make these videos available throughout the network. Although the video distribution system is just getting started, the district already has an electronic bulletin board in place that informs the community of school events, lunches, and closings due to weather.

When asked how such a small school district could afford such an elaborate technology system, Joe Lopez allowed as how he was asked that question a lot. "But if you believe, as we do, that technologies are a vital educational tool in the information age, particularly in remote rural areas, you just have to make it happen." The district had little additional monies for the technology plan, so it had to work within its existing budget. A re-prioritization was put into effect that would accommodate the technology plan. "Hard choices were made. We had to decide among good choices. And we came down on the side of technology. Some decisions were not always popular. But with determination on the part of school board and administration to move forward, and with the support of the community, we were successful." Certain programs were deleted, and the elementary school and middle school principalships were combined into one position. These budget cuts, along with the gradual and careful implementation of the technology plan, made the district's vision possible. " It doesn't come overnight," says Lopez. "We've been in the process for an extended period of time with a very specific plan on how to get there. With this kind of planning it's not out of reach for anybody, but you've got to make some hard choices and then act on those choices. That's how it becomes affordable."

The Oklahoma Mesonet

A statewide environmental monitoring network, Mesonet was created in late 1990 with the cooperation and commitment of the University of Oklahoma and Oklahoma State University through $2 million in oil-overcharge funds administered by the Oklahoma Department of Commerce. The network consists of 108 automated observing stations that blanket the state and continuously monitor such soil and weather parameters as temperature, relative humidity, wind speed and direction, solar radiation, pressure, and rainfall. Data collected during five-minute intervals are relayed every quarter hour over the state's law enforcement telecommunications system to a central processing site at the Oklahoma Climatological Survey at Norman. From this site, data are available through computer networks, bulletin boards, print and electronic media, and interactive public displays to the two universities, the state capitol complex, OSU's Noble Research Center, OU's Sarkeys Energy Center, government agencies, businesses, and public and private schools.

Mesonet offers educators the opportunity to apply climatology, meteorology, geography, agriculture, computer graphics, and telecommunications, using real-time data, in the classroom. Through Mesonet's pilot project, Earthstorm, designed for teachers and funded through the

National Science Fou ..ation, the U.S. Department of Energy's Atmospheric Radiation Measurement program, and the Oklahoma Department of Education, teachers attend special institutes to train them in both the technology and the content of Earthstorm. Supported by project staff and professional scientists, they then develop curricular materials for use in their classrooms and by other teachers. In 1992, 16 teachers participated in computer and science institutes. Those linked through the network have communications access through the Mesonet Bulletin Board System, which supports e-mail, conferencing, and file transfers through software designed specifically for the project. Among the services available through the bulletin board is contact with scientist-mentors, who are available to field questions and comment on projects. Students also may use the bulletin board system to post their own weather observations and to read those posted from other parts of the state.

Gary Sacket, an Earthstorm co-investigator and science teacher at Fairview's Chamberlain Middle School, concurs. The 22 kinds of data available to him in his classroom enrich his teaching in ways not previously possible. With funds awarded twice Sacket from the Christa McAuliffe Fellowship, has purchased an extensive collection of computer equipment for his classroom, including scanners, a laser printer, CD-ROMs, a video disk player, and a video machine that allow his students to turn information gathered from Earthstorm and other sources into sophisticated print and video productions. "They've been using this kind of equipment long enough now," he says of his students, "that they think of it as normal. That's what we want." Joann Ball, of the Comanche public schools, is similarly sold on Earthstorm and Mesonet. "The walls of my school have been extended," she says. "Using Mesonet, we now work in a laboratory without walls. Rural areas are at a disadvantage no longer."

Ball's words have special meaning at Maryetta public schools, a 22-square-mile district outside of Stilwell. Of Maryetta's 500 students, nearly 90 percent are Native American, and the average annual income of their parents is only $6,000. Superintendent Carthel Means says the district's connection to Mesonet has given his students special opportunities. "Our language arts classes involve students in grades five through eight in producing their own school news program that we broadcast on the local cable channel," Means says. "Through Mesonet, they get real weather information to integrate into the programs," which they write, illustrate, and produce themselves. "Some of the parents watch our show instead of the local programs. The kids love to see themselves on television, and so do their parents. It's done so much for self-esteem."

Two-Way Interactive Video: Two Texas Projects

One of many advanced telecommunications systems, two-way, full-motion, interactive video and audio is particularly applicable to rural education and community needs. In essence, two-way interactive video and audio can network rural schools, colleges, and/or service centers that have the capability to transmit and receive live programming. This capability is particularly relevant where populations are sparse and expertise limited. Two-way video enables the classroom or community service center to transmit and receive images and sound similar in quality to those found on professionally produced commercial television. Used creatively, this technology can revitalize rural communities.

(Described below are two interactive video sites, one in its third year of operation and the other planning to begin in Fall 1995.)

The TeleCommUNITY Network

This project, located in a small town in Central Texas, began operations in winter 1992. Although TeleCommUNITY Network came on-line recently, it was the first fully functioning two-way video and audio network in Texas K-12 schools. This project has a strong community focus in that the first phase of implementation involved participants from within only one community. Participants are the local school district, specifically the high school; a regional university; the local telephone company, a small commercial telephone company, rather than a telephone cooperative; and a Job Corps center located on the outskirts of town.

The initial vision came from an assistant superintendent and a school psychologist who were strong advocates of educational technologies. Support quickly followed from the local telephone company, which hired the school psychologist and a two-way interactive TV specialist, who had been trained on the technology in Minnesota, to facilitate the program. This is the only instance among the projects studied where professional facilitators were brought in to develop and coordinate the program. The telephone company also financed the installation of the technical network, including classroom equipment. The three on-line sites agreed to partially reimburse the telephone company over a five-year period.

TeleCommUNITY, with a 14-member planning team, started meeting in January 1990 and implemented its network in January 1992, linking three sites in the community. Through a series of grants and support from the telephone company and the university, TeleCommUNITY began a unique program called PATH Math (Partners for Access to Higher Mathematics). This program introduced pre-algebra skills to students who had previously failed in mathematics and were at risk in other higher-order skills related to computational tasks. The course was team-taught by a university mathematics professor, located at the university and linked via the network, and a school district mathematics teacher who was on the premises. Over 80 percent of the students passed the course. Students' progress will be monitored as they continue with mathematics and other studies.

In addition to the PATH Mathematics project, the university is offering dual-enrollment calculus to high school and Job Corps students over the network. The Job Corps is offering specialized vocational training to high school students and residents of the community. Scheduled courses for the upcoming semesters include Russian, Japanese, and college English.

Also active on the network are two programs that address the needs of adult learners. The first is called the World of Work (WOW) program, in which adults, including Job Corps students and community members, study literacy and job initiative strategies. The classes are delivered over ITV from the site at the Job Corps. Instructors and tutors are present at each site that is on-line.

Another major project is the Southwest Texas Center for Professional Development in Technology (SWT-CPDT). Currently funded with a $1.1 million grant from the state education agency, the center offers instruction to inservice classroom teachers in methods and techniques for using technologies in education. SWT-CPDT is concentrating on advanced applications of digital fiber-optics, including extensive integration of the Internet in elementary classrooms and creative uses of interactive multimedia networks and workstations.

Other plans for the network are as follows:

- to expand the network to outlying areas in adjoining counties, as well as within the community

- to construct additional classroom sites at the school district and university, featuring fully interactive video, audio, and data capabilities that will interface with other on-line class labs

- to support activities, including on-line computing and video, for children and adults of family literacy projects

- to connect with an ITV network that is developing in a nearby metropolitan area

- to add other sites to the community network, including a church, a library, a resort conference center, and a local detention center for drug offenders, in order to offer wider disbursement of adult education programs.

East Texas Learning Interactive Network Consortium (E-T LINC)

This project presently comprises several northeastern Texas school districts, two local telephone cooperatives, a locally based aerospace company, and a regional university. The first formal initiative came in fall 1991 when a school district media coordinator recommended sending an expert to visit the San Marcos TeleCommUNITY project. A telecommunications specialist from a local aerospace company who had a strong interest in educational technologies was selected to go. This visit proved very productive in terms of enlightening the E-T LINC project and forming an alliance with the TeleCommUNITY project that has been instrumental in the progress ET-LINC has made up to this point. The visit also solidified relations between the school district and the local aerospace company. The telecommunications specialist became a strong advocate of the two-way interactive program and a participant in its formation.

A local telephone cooperative expressed strong interest in being involved and offering support. A consultant for the cooperative was already familiar with the TeleCommUNITY operation and was an enthusiastic advocate of the technology. A second telephone cooperative joined the ranks subsequently. The project gained further strength in fall 1992 when the assistant superintendent of the San Marcos school district moved to a nearby school district in northeast Texas, bringing her expertise and enthusiasm. She soon enlisted the support of her superintendent and began conducting workshops to educate neighboring schools about the technology. She is also in the process of writing grants and soliciting funding from numerous foundations. Her school has already been awarded a technology planning grant from the Texas Education Agency (TEA) which has helped her continue her research and workshop funding, and she is positioning her consortium to apply for a technology implementation grant that is expected to be announced by TEA in the near future.

Formal meetings that included visionaries from interested school districts, the telephone cooperative, and the aerospace company began in fall 1992. These have continued on a monthly basis. Soon thereafter, the local telephone cooperative established a liaison with the dean of education at a regional university, who also joined the effort. The dean had been involved in distance learning technologies in another state and was interested in reaching out to area schools in northeast Texas with similar technology.

Several school districts involved in the project have relatively complete curricula and are not strongly motivated to share teachers at the high school level. Other, smaller school districts need to share resources in the area of fine arts, foreign languages, and advanced mathematics and science. This disparity in course needs at the high school level needs to be worked out.

However, all schools extremely, interested in making university-level courses available to their students and community, and the participation of the university has been essential for continued interest and commitment.

The school districts and the university see linkage via two-way interactive video as a benefit for the following reasons:

- Classroom enrichment for school district students with participation of university professors serving as "master teachers"
- Dual-enrollment courses for high school students
- Graduate courses for inservice teachers
- Undergraduate courses for school district paraprofessionals and place-bound community members
- Sharing of actual classroom practices with preservice teachers at the university
- Monitoring of pre-service teachers while they are student teaching
- Demystification of the university environment, thus making higher education more accessible.

Demonstrating a strong commitment, the regional university has recently hired a program coordinator to facilitate the implementation and management of the system, as well as other outreach programs in area K–12 schools. The university plans to be fully functional with its own interactive teaching studio by summer 1995. The coordinator is currently organizing meetings with interested school superintendents in the area and showing the video *Local Heroes* in order to communicate the potential of the technology. She is also making copies of the video available to superintendents so that they may show it to school board and community members. The coordinator's activities have been influential, along with the above mentioned visionaries, in accelerating momentum toward the implementation of the technology.

The confluence of diverse influential entities, including ongoing support from the TeleCommUNITY Project and the addition of a professional organizer, is anomalous among the six projects studied and bodes well for the success of the project. ET-LINC participants are busily writing grants for additional support, forming alliances in northeast Texas, and seeking firm commitments from a small number of school districts to forge ahead with the hard planning and resource allocation necessary to begin the first phase of implementation.

Project

New Dimensions in Writing: Using Groupware Writing Tools in Telecommunications or on Local Area Networks

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Abstract
Groupware tools, such as Aspects, define a new collaborative dynamic for writing by enabling writers at different stations to work within the same document at the same time. This session will explore the impact of such tools on the writing process at all stages from idea generation to publishing. What new skills are demanded by this collaborative, real-time writing environment, where words alone, unaided by body language and tone of voice, carry the message? This session will feature a live on-line session with this tool.

Policy

Telecommunications Teacher Training: Meeting the New NCATE Unit Standards

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Key words: standards, accreditation, technology, teacher education, telecommunications

Abstract

Supporting classroom instruction with telecommunications resources is dependent on access to hardware, software, services, and appropriate teacher training. Recent changes in the National Council for Accreditation of Teacher Education unit standards require that professional teacher preparation programs provide this support for use of technology in education. Universities will address these standards in a variety of ways.

Introduction

The new NCATE unit standards include indicators relating to support for technology infusion into professional teacher preparation programs. This long-awaited recognition of the importance of technology for teaching and learning from the educational evaluation establishment brings with it the responsibility of revising teacher preparation coursework to benefit from the added technology resources.

Changes in NCATE Standards

Specific changes relating to technology in the new NCATE standards include the following indicators.

Content Studies for Initial Teacher Preparation

Candidates complete a sequence of courses and/or experiences to develop an understanding of the structure, skills, core concepts, ideas, values, facts, methods of inquiry, and uses of technology for the subjects they plan to teach.

Pedagogical Studies for Initial Teacher Preparation

Candidates complete a well-planned sequence of courses and/or experiences:

- in professional studies in which they acquire and learn to apply knowledge about the impact of technological and societal changes on schools; and

- in pedagogical studies that help develop understanding and use of educational technology, including the use of computer and other technologies in instruction, assessment, and professional productivity.

Faculty Qualifications

- Higher education faculty are knowledgeable about current practice related to the use of computers and technology and integrate them in their teaching and scholarship.

Resources for Teaching and Scholarship

- Faculty and candidates have training in and access to education-related electronic information, video resources, computer hardware, software, related technologies, and other similar sources.

- Media, software, and materials collections are identifiable, relevant, accessible, and systematically reviewed to make acquisition decisions.

- There are sufficient library and technical staff to support the library, instructional materials collection, and media/computer support services.

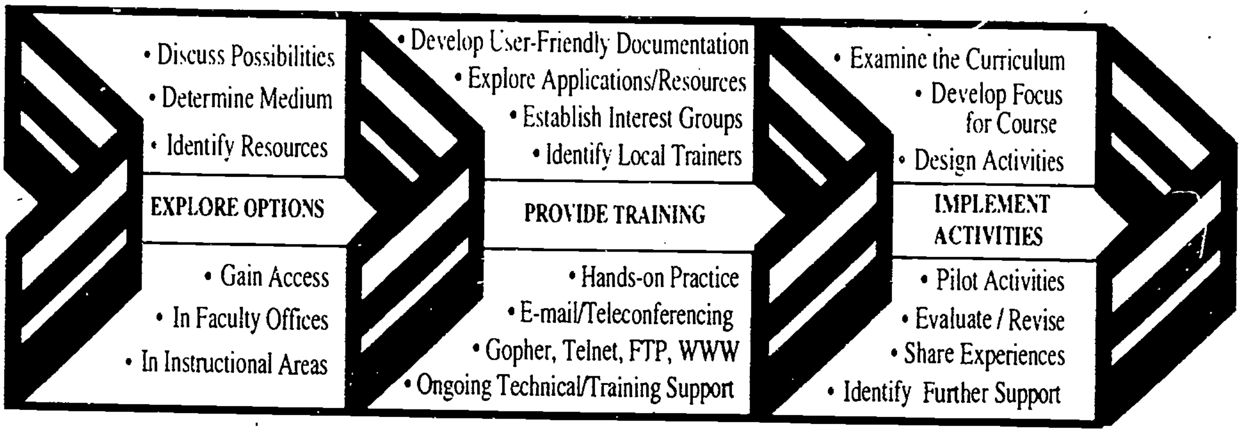
Resources for Operating the Unit

- Facilities and equipment are functional and well maintained. They support computing, educational communications, and educational and instructional technology at least at the level of other units in the institution (NCATE, 1994).

Meeting the Challenge of New Standards

With expectations of NCATE clearly supporting information technologies in teacher preparation, colleges of education will be faced with planning to meet these standards. Items to consider when developing plans to address the accreditation guidelines for telecommunications are listed in the following figure:

FIG. 1: INFUSING TELECOMMUNICATIONS IN TEACHER PREPARATION



Conclusion

The NCATE standards require necessary infrastructure to ensure that colleges of education will be able to include telecommunications resources in their teacher preparation programs. Without these new standards many programs would remain isolated from the vast information resources available to supplement learning and teaching.

Reference

NCATE, NCATE Unit Standards. May, 1994

Project
The California Young Scholar Program: Telecommunicated University Instruction for Rural Schools

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Key words: distance, rural, multimedia, university, video

Abstract

The California Young Scholar Project is a two-year program to design and deliver university-level courses to advanced students in very rural California schools. The program consists of five Cal State campuses (Cal State Dominguex Hills, Chico, Sacramento, Stanislaus, and Cal Poly Pomona) providing instruction to students in 26 rural high schools. Each campus is producing one course, and all five are collaborating on a sixth course. Technologies involved are videotapes, computer conferencing, audio conferencing, and print. The program is being evaluated by the Western Cooperative for Educational Telecommunications.

Overview

The California State University (CSU) believes students in rural California are a vital yet underserved state resource and that linkages between itself and the rural K-12 system are essential. Therefore, as part of a series of technology demonstration projects, CSU has funded a two-year project to design and deliver university courses to advanced high school students in rural areas. Five CSU campuses will be involved. Cal Poly Pomona will be the lead campus, working in collaboration with Cal State Chico, Sacramento, Stanislaus, and Dominguez Hills. During the 1993-94 academic year the campuses will redesign a total of six general education courses to be delivered during the 1994-95 academic year. Each course will provide fully transferable university credit to students. Twenty-five rural schools will be selected to participate in the demonstration project.

The Courses

During the 1994-95 academic year, the following university courses will be provided: Fall 1994,— Consumer Chemistry (Pomona), Human Geography (Chico), Brains, Minds & Computers: Introduction to Cognitive Studies (Stanislaus); Spring 1995,— The Visual Arts (multicampus), Mexican-American Studies (Dominguez Hills), Physical Anthropology (Sacramento). Each of these courses provide general education credit on their own campus, although not necessarily on all CSU campuses.

The Model

Each course will be redesigned into a course package consisting of videotapes, computer conferencing, telephone conferencing, and print. Contrary to traditional distance learning, most of the activities in these courses will not be live. Research suggests that live instruction is not essential to learning, and the varied bell schedules of rural schools make live telecommunicated instruction difficult.

The Schools

Twenty-five rural schools will be selected to participate in the project. Each school should identify one person, usually a librarian or an interested teacher, to act as a facilitator. The facilitator's role includes making certain that students work diligently and assisting in communications with the CSU institutions. The facilitator will act as a partner with the university faculty and will help in recruiting students and proctoring examinations. In addition, each school must have a VCR and monitor, as well as a study and viewing area. Schools must also provide students with access to a computer and modem for communication with the CSU, a fax machine, a speakerphone, and satellite transmissions for occasional live broadcasts.

The Students

The California Young Scholar Project will require that students be either juniors or seniors, have a 3.0 high school GPA, and be recommended by the principal or guidance counselor.

The Cost

Because the California Young Scholar Project utilizes a special fee-waiver program for gifted and underrepresented minority students, students pay only $4 per term to participate. In addition they are expected to purchase books and materials—about $75 per course. Schools participating in the program will pay a $250 annual participation fee.

Curriculum

Cruising the Net with Student Drivers: E-mail, E-mail Everywhere

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Key words: e-mail, netiquette, classroom projects, collaboration, listservs, timelines

Abstract

Internet allows all classrooms to communicate, access information, and take part in a variety of global projects. It is a worldwide network of independent computer networks connected and communicating with each other. As an exciting teaching tool, the Internet allows rural and urban classrooms with a computer, a telephone line, a modem or network connection, and an Internet account unending access to the world. Students and teachers can use this tool to communicate, to access information, and/or to take part in a variety of projects.

One way of communicating via Internet is electronic mail (e-mail). E-mail is more like an informal conversation than letter writing, but recipients cannot see body language. Consequently, Internet users need to develop certain writing skills, or network etiquette, now commonly referred to as netiquette. Netiquette refers to proper user behavior on electronic networks (USENET Primer, 1990). The writer needs to think about the audience that he/she is trying to reach, be careful with humor, sarcasm, and anger, keep messages brief, be cautious, and identify him/herself. The writer needs to remember that his/her words are open to the interpretation of the reader. One rule of thumb is to type only information that can be printed on the front page of any newspaper. Because readers cannot hear words or see body language, subtle humor tends to get lost. Internet users have developed a set of symbols which the writer can use to show emotions. One uses these symbols, e.g. :-) or <grin>, to remind the audience of the writer's meaning.

Classroom e-mail activities are numerous. Many are developed through listservs. When looking for or developing an activity, pay careful attention to the timeline. Seventh graders from Baker Demonstration School at National-Louis University began using Internet e-mail by participating in "Traveling the World, a Virtual Vacation," sponsored by the Kidlink organization. Participation in this project required a computer, an Internet or Bitnet connection, and listserv subscriptions. Project participants from 57 schools and from about 42 different countries exchanged e-mail messages about local geography, language, and culture. Students also took part in Internet Relay Chats (IRC) to exchange more information. All participants learned much about the world and communication in it.

Last year, Oakton Elementary School in Evanston, Illinois, received a Pioneering Partners grant that included an Internet account. Because of this grant, children in the first and fourth grades participated with other children of like ages from all over the world in an e-mail project called "TeleOlympics" by Academy One Projects. The schoolchildren participated in four different athletic events. Oakton School's physical education teachers were thrilled to take part in this exciting venture. Participation allowed them to see an extraordinary way in which computers can be a part of their teaching experience too. The results of the students' efforts were tabulated and the first-, second-, and third-place winners at each age level were reported to all of the participating schools. Win or lose, "TeleOlympics" was a wonderful learning experience.

Demonstration
Internet Shareware and Freeware for DOS and Windows

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Key words: Internet, telecommunications, computer software, shareware, freeware, DOS, Windows

Abstract

The Internet continues to be a gold mine of education-related computer software, available instantly at little or no cost. This demonstration focuses on five key aspects relating to the identification and acquisition of DOS and Windows software residing on Internet computer systems:

1. *Most popular and widely-used DOS/Windows freeware and shareware, as identified by educators and other computer users*

2. *The use of Archie servers on the Internet as a means of locating the desired software*

3. *The use of file transfer protocol (FTP) to retrieve the desired software*

4. *A review of popular compression/decompression software for DOS and Windows*

5. *The use of virus-checking software to prevent virus contamination.*

The demonstration will take participants through the necessary steps for identifying, acquiring, decompressing, virus-checking, and running an Internet-resident computer program.

Special Project
The Elementary Link to the High School Link

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Key words: interdisciplinary, bilingual, multimedia

Abstract

The Los Angeles Learning Centers, one of nine sites funded by the New American Schools Corporation (NASDC), is a large urban school with predominately Latino students whose primary language is Spanish. Telecommunications is assisting these students by creating a bridge for those who lack visual experiences, access to diverse resources, and tools for fully communicating their perspectives. We traditionally teach and test these students as though they have come to school prepared with common experiences. We are becoming increasingly aware, however, that these students are enrolling in school with very limited language acquisition experiences or exposure to events, facilities, or natural settings outside the five-mile area in which they live.

International Project
Colombian Interscholar Communications Networking

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Key words: interscholar project, computer technology, computer network, quality of education, new pedagogical methodologies

Abstract

This article describes the Colombian interscholar Internetworking project, CONEXIONES. It analyzes the technological substructure and describes the platform used, its implications and its projections. It also describes the global context that would make local and cooperative work possible among schools. A new impulse has been given to curriculum renewal, reviewing the academic programs, the activities in the application of knowledge and appropriction of technical development as well as elimination of generic stereotyping and seeking to build in students constructive attitudes toward work and problem solving. Finally, it emphasizes the goals that should be reached so that the Colombian interscholar networking structure can become a reality.

Education and Society

Our scholar system has to examine its role in society, its way of operation. It should emphasize its compromise of educating, but not the one in which you have one teacher "talking about" knowledge as an active element confronting a passive group of students. It therefore requires an educational system that favors the development of high-level thinking abilities and/or cognitive strategies, using as resources the tools provided by the new computer technologies such as productivity tools, multimedia tools, and information networks, allowing teachers to prepare children and young people for a society based on knowledge in which all social values are changing to a new order.

What are Interscholar Networks?
The new technologies cannot revolutionize or even "evolve" education. The technologies should be applied on interrelated political and organizational events' systems [Press, 1993].

The perceptions of the changes in society, in economy, in technology include understanding how people approach different learning processes increasing the interdependence between science and technology, between the knowledge of the production processes and the teaching and learning of them. Those changes should manifest themselves in new scholarization methods that permit the improvement and comparison of the opportunities in a democratic society.

We can accept that teachers and students can teach and learn individually as well as in group under a geographic distribution structure of the human resources and information [Hunter, 1993]. Many of the interscholar projects develop activities, that take advantage of the fact that educators and students can interact with people, information, and equipment that accesses electronic ways using computational equipment and communications networks, inside the institution as well as distributed over the globe.

The scholar can then look at school as a training place related to real-life work, not by imitation but by experiences that show it.

A number of communications networks for teachers and students exist in Third World countries. It is important to bear in mind that the majority of these use as their infrastructure the Internet network.

Description of the CONEXIONES project
CONEXIONES is the name given to the Interscholar Colombian Network. This project started at the beginning of 1993 with the patronage of the Corona Foundation and the University EAFIT and with the collaboration of the Departmental Education Secretary of the Department of Antioquia, more concretely from the Teaching of Technology for the 21st Century project. Furthermore, it counts with the counseling of Dr. Pedro Hepp, coordinator of the ENLACES project from Chile, Dr. Joel Halvorson of the TIES project from the United States, Dr. Ana Beatriz Chiquito of the ECUT project from Noruega, Dr. Jim Patterson of the Education in Technology Investigation Unit from Goldsmiths College in the University of London, and Dr. Gilles Imbeau of the Computer Science Department from the University of Quebec in Chicoutimi.

The project is based on three basic areas that can extend the quality of education:

- The curricular redesigning according to the demands of a new teaching-learning environment
- Education in technology, preparing the student to approach the new technologies
- The educational telecomputation, which absorbs the use of computer tools within the traditional curriculums

The traditional classroom tends to migrate from a workshop of technological tools to a dynamic and interactive space, integrator of the technological environments with the group of proposed objectives.

During the first year, a sensibilization program was carried out with the teachers of the pilot institutions in everything related to the computer technologies and additionally in the basic productivity tools.

In the work is centered on the rescue of the teacher, taking him to generate attitudinal changes that facilitate the instruc.'onal design, and develop prospective thinking abilities .:. the student. Starting from the information to which he has access, he interprets, analyzes, and re-creates with definite criteria.

This obligates the teacher to design, adapt, and select the different activities from the expressed needs of each particular group, facilitating the achievement of their project always in agreement with the institutional macro project.

Additionally and in a parallel way, the development of a man-machine interface with the metaphor of the typical town of Antioquia, was started, so that in the future the student can work in a family-like environment. In the town park they are designing a culture house, a museum, a library, a post office, and a paper stand.

The creation of the network is being done with a gradual advance method, using software interfaces that do not require computer training and taking advantage of the interest of the cooperative work that has already been shown to be effective, attractive, and realistic.

Conclusions

We want to show the scholar community that computers can play important roles in the process of generating spaces for creativity.

The new technological advances require better-informed and -prepared children and young people to confront the changes that will occur during their careers and their professional lives. The adaptation capacity and the entrepreneurial spirit are qualities that become more and more important. Without them our region will be unable to compete effectively, to stimulate growth, and to create new work possibilities.

In a society that every day grows more interdependent, it is necessary to form citizens that are able to communicate with one another, and to collaborate with colleagues from other countries, thanks to a better knowledge of the economic and social structures of their neighbors.

On the other hand, in a world that is every day more competitive, it is vital that we account for the necessity of a tighter cooperation between communities. To foment this mentality between the students is one of the best ways to guarantee that the future leading generations will understand the alliances with businesses from other countries as a natural and positive action-line, instead of contemplating it as a potential source of risk and danger.

The youth of today will make the world of tomorrow. Before this evidence, one should not doubt giving youth an opportunity to get to know each other. As a matter of fact, in the contexts of the actual efforts to promote the conscience, the solidarity, and the rescue of the cultural and social values, the interactive communication that suppresses the barriers between youth of different nationalities occupies a decisive place in preparation of that youth for the active life.

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Modern Language/ESL

E-mail: Real Life/Classroom Experiences With a Foreign Language

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Key words: foreign, language, culture, e-mail, pen-pal, goals, planning

Abstract

Pen-pal activities have long been used by foreign language teachers to provide students with real-life opportunities to use the target language and to interact with people from other cultures. Today the increasing globalization of the economy and the exponential growth of information worldwide accentuate these goals. Communicating via electronic mail is a natural extension of such activities. Factors such as the short wait between responses and a potentially higher response rate make e-mail preferable over traditional mail correspondence. But beyond this, e-mail correspondence enables students to use the resources of the information age at the same time that it enhances the language-learning experience.

Language studies are enriched by increased opportunities for students to select the content of their own learning processes, to integrate their work with that of others, to solve problems, and to develop higher-order thinking skills. We have empirical evidence that language acquisition is positively affected by structured bilingual cultural exchanges via Internet. Participants in bilingual cultural exchanges are more aware of both differences and similarities between the cultures of L1 and L2.

While foreign-language teachers are now beginning to utilize e-mail communications, such activities must be properly designed and managed in order to maximize the benefits. Initially, decisions must be made concerning the role that e-mail will have. Will it be a supplementary activity or will it be integrated into the total curriculum? Will accomplishing the tasks imply covering grammar/vocabulary oriented curriculum objectives? Will it be an end in itself or will it be the means with which to accomplish another goal? Will it be a whole-class, group, or individual activity? Will synchronous as well as asynchronous electronic communications be utilized? Will the target language be utilized when dealing with the mechanics of telecommunications? Will students both send and receive messages in the target language or will it be necessary to concentrate on just one skill? How will e-mail partner students be located?

What if there are too many partners? How much time will be spent on these activities? After the initial "Hello. My name is ____. I have two brothers, etc." how should the students continue? These and others are questions which require careful consideration before beginning an e-mail project.

E-mail can provide benefits to foreign language classes that traditional activities cannot provide. Telecommunications projects produce high quality student work and commitment to high level content as they personalize the learning process and introduce students to the benefits of modern communications systems. However, careful planning is necessary to ensure that these projects provide the types of activities that will be of most value to foreign language classes.

Paper
Evaluation of Nontraditional K-12 Courses Offered via Satellite

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Key words: satellite courses, evaluation, distance ed, feedback

Abstract

Ongoing assessment of distance delivered courses has helped the Satellite Telecommunications Educational Program (STEP) in Spokane, Washington to monitor and adjust delivery methods to better serve client needs. This session will discuss the results of research conducted to assess 1) the perceptions of key stakeholder groups on the implementation of a federally-funded distance education program and its impact on participating schools and communities in a five-state region, and 2) the effects of interactivity on success in televised courses. The study findings are discussed in terms of student success rates, and educational equity, professional development, and rural viability.

Stakeholders' Perceptions of Distance Education: Program Benefits and Implementation Barriers

Perspectives

The Satellite Telecommunications Educational Programming (STEP) network, a division of Educational Service District 101 in Spokane, Washington, was developed to provide equal learning opportunities for all students regardless of geographic location or educational resources. In 1990, STEP joined with state education agencies from Alaska, Idaho, Montana, Oregon, and Washington to form the Pacific Northwest Star Schools partnership to provide distance education services to the five-state region. It has become a two-time award winner under the federal Star Schools program administered by the U.S. Department of Education.

Using federal funds, STEP enhances and expands distance learning in a region connected by culture and economy. The program offers telecast courses on a wide range of topics, including foreign languages, mathematics, and science in support of federal policy initiatives (National Education Goals Panel, 1993; U.S. Department of Labor, 1992; U.S. Department of Education, 1991). Distance education is provided to approximately 500 schools serving some 6,000 students in the middle and high school grades in the five states. In addition to student services, the program also provides professional development activities to teachers and school administrators.

Participating schools receive start-up equipment (e.g., satellite dishes, computers, modems, and scanners) through federal funding. Technical assistance is provided by the STEP/Star Program, as well as the respective states, in installing and maintaining the equipment. Upon paying a membership fee, the schools may select from a wide array of offerings any telecast courses and inservice activities that they deem appropriate for their students and school staff. A majority (90%) of the participating schools are located in rural areas. The average program site is approximately 80 miles from the nearest university or college.

In 1992-94, an external evaluation was conducted to assess the implementation of the STEP/Star Program and its impact on participating schools. The study included questionnaire surveys and focus group meetings with key stakeholder groups, interviews with participating students, and performance assessments to evaluate student outcomes. This paper presents findings obtained from focus group meetings and surveys with the stakeholder groups.

Methods and Data Sources

The primary data collection methods included focus group meetings with the key stakeholders and questionnaire surveys with district and school administrators, parents, and students.

Focus Groups

In late 1993 and early 1994, the study team conducted ten focus group meetings in the five-state region. The discussions were held to obtain stakeholders' perceptions on processes and outcomes of the STEP/Star Program as it was implemented in each state. Six of the discussions occurred at on-site meetings. Four took place via teleconferences. A total of 84 stakeholders, including school board members, district superintendents, principals, program coordinators, teachers, students, and parents, participated in the discussions. The discussion topics centered on four general themes: course offerings, staff training, barriers to implementation, and program impact. Each meeting lasted approximately two hours.

Parent and Student Surveys

The student and parent surveys were conducted in December 1993 and January 1994 to obtain the perceptions of these groups on service delivery and its effects. The surveys were returned by approximately 70 percent of the STEP/Star sites in the five-state region. A total of 1,636 students and 808 parents completed the respective surveys.

AdministratorsSurvey

The survey was conducted in September and October 1993 to assess client needs with respect to distance learning and to obtain client perceptions on program processes and outcomes. A total of 440 superintendents and building administrators of STEP/Star program sites participated in the survey, representing a response rate of 90 percent.

Results

Program Benefits

Among the most valued outcomes of distance education are increased opportunities for students, increased staff development opportunities, and lower instructional costs. With the exception of lower instructional costs, a majority of the local administrators indicate that these outcomes are occurring in their schools or districts.

In the questionnaire survey, local administrators were asked to rate the importance of obvious outcomes of distance learning as "priority", "very important", "important", "somewhat important", or "not important". A large majority of the respondents provided high ratings (i.e., important, very important, or priority) for a wide array of outcomes. The local administrators were also asked to rate the extent to which the various outcomes were occurring in their schools or districts. On a five-point scale ranging from "great extent" to "not at all," a majority of the respondents provided favorable ratings (i.e., ratings of 3 or higher) on most of the outcomes. Table 1 provides a summary of the survey results.

Table 1. Ratings by Local Administrators on Importance and Occurrence of Outcomes of Distance Education Outcome

	Percent of respondents providing high ratings on importance	Percent of respondents providing favorable ratings on occurrence
• Increased opportunities for students	97	85
• Increased staff development opportunities	80	68
• Lower instructional costs	65	39
• Improved quality of instruction	71	60
• Self-sufficient learning	74	66
• Enhancement of curriculum development	86	73
• Timely access to previously unattainable information	87	72
• Interdisciplinary and collaborative teaching	66	49
• Access to resources	75	45
• Use of new technologies	85	80
• Decreased sense of isolation	76	63

• Increased community/school linkages	67	44
• Providing a global context	87	70

More than two-thirds of the local administrators indicated that they would continue to implement distance learning programs for the next five years, with a majority anticipating an increased use of distance education. Among the current telecast courses, foreign language classes (i.e., Japanese and Spanish) appeared to be the most popular. A large majority of the local administrators felt that enrichment courses in foreign languages, science and mathematics should be provided to the general student population. Most believed that the STEP/Star Schools Program should collaborate with colleges and universities to serve the adult population, offering basic college courses, classes that help adults get a job, GED preparation, and classes that help workers improve their job skills.

There was a consensus among the stakeholders that STEP/Star provided courses that otherwise would not be available to students. For example, close to half (49%) of the students indicated that they took the STEP/Star courses because the courses were not offered in the regular school program. Forty percent took the courses as part of college preparation.

Participating students generally had positive perceptions of the quality of the telecast courses. Specifically, a majority of the students rated the following aspects of the STEP/Star courses favorably (i.e., good or excellent):

- Quality of the course content (78%)
- Ability of the studio teacher (80%)
- Technical quality of the broadcast (75%)
- Technical quality of printed materials (74%)
- Instructional methods used in teaching the courses (68%)
- Ability of the classroom coordinator to facilitate interaction (69%)
- Availability of studio teaching assistants (66%)
- Student interaction with the studio teacher (53%)

Student comments in focus group discussions were indicative of very positive attitudes toward distance education. Examples include:

"The course broadens our horizon, showing us what is out there. We learned a lot of things we never heard before."

"I am learning a lot more than what I would from a regular teacher, and it's fun to listen to kids from other schools."

"I'm really excited about it. I'm glad I can take a fun course. We can get a greater variety of electives than we can at a regular high school. We have a choice of the presenter where in a regular school you don't."

Many teachers indicate that they have become better instructors as a result of watching the studio teachers, particularly with respect to teaching interdisciplinary courses. Through in-service offerings, they have become better informed about curriculum and instruction. The program has provided teachers the opportunity to continue to improve their teaching skills.

In some cases, the spin-off effects on small rural communities have been great. Having greater access to education via satellite, families are now staying where they want to be and rural communities are being strengthened. As one school board member in a rural district puts it:

"Our community worked hard to get this. We were seeing a tremendous dropout rate from 6th to 8th grade. Now they can stay here and the rate is much better. This is a great blessing to the community. There will be spin-off benefits down the road. The reason why STEP/Star went over well here is that there was a real need."

Implementation Barriers

By far the most challenging aspects of implementing distance learning programs are funding and scheduling. Other barriers include a lack of equipment in the classroom, a lack of standardized equipment for interconnects, a lack of local and state administrative support, staff resistance to change, and staff misgivings that they may be replaced by technology.

Conclusions

According to key stakeholders, distance education services offered by the STEP/Star Program have positive impact at the student, school, and community levels. Specifically, the program has

- increased access to learning opportunities
- enhanced the capability of school staff, and
- strengthened the viability of rural communities.

With technological advances, distance education will become less costly, and therefore more affordable, and will take on increased importance as a vehicle for restructuring education in this country.

Interactivity as a Predictor of Student Success in Satellite Learning Programs

Satellite distance learning programs were developed several years ago, primarily for business and university audiences (Siaciwena, 1989; Bruce, Katz, & Tomsic, 1991; Coldeway, 1991). Since the mid-eighties, satellite courses developed for public school students in rural and remote districts have also increased in number (Linking for Learning, 1989). Typically, students enrolling in such courses were interested in such college entrance requirements as foreign languages and would not be considered "at-risk" for school failure. With growing awareness of the skills that all Americans need to function effectively in the workplace (SCANS, 1991), diversity of distance learning courses has expanded to include technical preparation courses.

Given the pioneering nature of many distance learning courses, research regarding effective practices and strategies is absent or sketchy at best. However, key factors from traditional learning environments may also affect students who are learning at a distance. This study examines the results of an innovative technical preparation course offered via satellite to students throughout a wide geographic area. Interactivity, a variable thought to be a key predictor of student success in traditional settings, is measured as compared with course grades.

Background

Through the assistance of a large educational agency serving the Pacific Northwest, an applied physics course was offered via satellite to traditionally underserved students in that region. This course was developed by the Agency for Instructional Technology and the Center for Occupational Research and Development to address the learning needs of students who might otherwise be excluded from advanced science classes. This Principles of Technology course offered by the agency was an attempt to provide applied physics to students in remote areas, as well as to students in more urban areas for whom nontraditional courses might be successful. This hands-on course was taught live, four days a week via satellite to students throughout a five-state area.

As needs arise for smaller and more remote schools to tap into the breadth of distance programs, the challenge remains to assess continuing student success and the factors contributing to their success (Willis, 1992). Ample research now exists reporting the importance of student-teacher interaction in the success of students in self-contained classrooms (Good & Grouws, 1979; Slavin, 1981). The use of correctives and feedback, for instance, allows students to monitor their own learning, adjust to delivery of new information, diagnose misunderstanding, and seek assistance. In short, teacher interaction with students may be as important as well-designed lessons.

Some researchers in distance programs have begun to address the concept of differing types of interactivity. Moore (1989) for instance, refers to learner-content interaction, learner-instructor interaction, and learner-learner interaction. Learner-content interaction refers to the learner's interaction with the program materials. Learner-instructor interaction includes the instructor's ability to motivate students during class as well as direct contact between the student and the instructor.

The present study examines the effect of direct student-to-teacher interaction as they communicate verbally over the telephone upon student achievement in the distance learning situation. The research question generated from the emerging literature on distance education and research on teacher feedback became: (a) Does frequency of student call-ins to the course instructor accurately predict success as measured by positive change in pre- to posttest scores?

Methodology

Subjects selected for this project included 41 high school juniors and seniors enrolled in Principles of Technology (PT) at each of seven school sites throughout the broadcast region. This course was taught throughout a five-state area by an instructor who was instrumental in the development of the curriculum, had taught PT for five years, and had four years experience as a distance learning teacher.

To assess overall progress in the PT curriculum, a pretest was administered before the beginning of instruction. At the end of the school year, a posttest was administered, with point gain used to measure overall progress for each of the 41 students.

Telephone logs recorded the number of times students contacted the instructor during broadcast instruction and after broadcasts. Both the instructor and his teacher assistant maintained daily logs of all phone activities during the course of the school year.

A correlational analysis was then conducted, using student audio interaction with the instructor as the factor that would most significantly affect student performance gains. The JMP data analysis program (SAS Institute, 1989) was used to calculate a prediction equation to determine the magnitude of the correlation between the number of call-ins to gains from pre- to posttest scores.

Results

The expected linear regression in which student pre- to posttest gains could be predicted by the number of student call-ins did not occur (r-squares for the prediction equaled .02). The r-square tells us how much the variation of test gain can be accounted for by the variation in student call-ins. When the coi. idence curve was determined using a polynomial equation, the results altered only slightly. This time the r-square for student call-ins indicated that only 14 percent of the variation in pre- to posttest gain could be explained by the frequency of student contact with the television instructor.

At this point, several outliers from one school site were noted in the descriptive statistics, possibly because of the late arrival of lab equipment at one particular site. After these scores were dropped from the analysis, the polynomial curve had an r-square of .46 ($p < .01$).

Examination of resultant data revealed a relationship of interest. The data displayed in a polynomial fit (inverted U) and indicated that students on either end of the sample (those who called very frequently and those who called infrequently) gained the fewest points from pre-to posttest. Total call-ins were recorded along the x-axis and overall course gains for each of the 21 subjects were recorded along the y-axis. Students who called very frequently (12-15 times per semester) or very infrequently (0-3 times per semester) obtained the lowest overall course gains. Those students whose number of calls to the course instructor fell within a mean range (4-11 calls per semester) gained the most in course scores.

Conclusions and Classroom Implications

Interactivity has long been perceived as an important variable in effective instruction. Lack of eye contact on the part of the course instructor in distance programs can sometimes contribute to a feeling of isolation on the part of the instructor as well as that of the students. A key feature of the satellite educational program in this study is student access to a toll-free 800 number that relieves them of having to rely on incomplete information obtained from peers or classroom coordinators not versed in physics.

However, it appears that interactivity as measured by the number of phone calls students made to the studio instructor may not always correlate positively with student learning in distance courses. At least with this applied science course, a moderation of student telephone interaction appeared to coincide more directly with student success. This result could be explained by the possibility that students who called infrequently, as expected, were not highly enough involved in the learning taking place over a distance.

An unexpected outcome of this study indicated, however, that extremely frequent phone interaction did not predict a high level of involvement or student progress in this course. Possibly these students were calling because of their awareness that they were not succeeding as they might like to in the distance program. Most research on student-teacher interactions focuses on teacher behaviors, and a few studies have indicated nonlinear relationships between what happens in the school and student achievement (F iner, 1977; and Soar & Soar, 1979). Results of this study indicate that nonlinear relationships may also exist between student behaviors and student achievement, at least in some educational settings. For this reason, as more instructors move toward distance delivery of course content, they cannot assume that a high level of audio interactivity indicates a high level of student performance gain in the subject area.

These results have implications for the classroom coordinator and the student at the distant location as well as for the course instructor. Reliance upon course materials, peer tutoring, and live broadcasts are probably equally as important as interaction over the phone with course instructors. It seems likely that if any of these elements are missing or over emphasized in the learning equation, achievement gains will suffer. Further studies should investigate the magnitude of each of these factors in predicting student success in distance courses.

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Demonstration
Using Teleconversations to Explore Social Issues

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Key words: colleagues, teleconversations, questions, data, communication, issues

Abstract

A brief description of the principles that shape the NGS Kids Network curriculum for grades 6-9 will focus the presentation. These principles are listed below.

- *Students address topics about aspects of the natural world and apply their ideas to important environmental and social issues.*
- *Students engage in activities similar to those undertaken by professional scientists.*
- *Students use a computer network to exchange their findings, ideas, and questions with colleagues in other classrooms.*

Field-test data from the How Does Your Body Get Oxygen? unit will demonstrate how teleconversations (electronic letters transmitted to fellow researchers) provide opportunities for students to apply these principles to important environmental and social issues. The presentation will use software designed for the curriculum to show that teleconversations enable students to learn about the concerns of students in other geographic areas and that they motivate them to extend their research into new and different areas. It will also explain how teleconversations are a mechanism for sharing information on an ongoing basis and show that they are a way for students to express opinions about issues that they think are important. In summary, the presentation will demonstrate that Kids Network would not be Kids Network without teleconversations.

Demonstration
"Bear"ing in Mind Our Shared Values in a Global Village

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Abstract

John Wayland Elementary is located in the town of Bridgewater, in the Shenandoah Valley of Virginia. It is a place where you can find Civil War battlefields, Mennonite families with old-order ways, and small country stores. The valley has had a relatively homogeneous population but over the past 15 years new businesses coming from other areas and a rapidly expanding university have resulted in dramatic population changes.

Our school wanted to prepare the students for a world where they will have to work with and understand people from different cultures. We wanted to introduce our students to the differences they will soon be encountering in their daily lives. We wanted to teach respect for each other's individuality and cultural differences while recognizing their shared values.

As a classroom teacher, I decided that I could offer my students these ethnically diverse experiences by using people and technology. By going "Across the Lines," through a special telecommunications project on the AT&T Learning Network, I wanted my students to work together and share their lives with students from different backgrounds and different cultures.

I enlisted our school mascot, J. Bear, as our Partner in Learning, making him a Junior Ambassador to our Learning Circle Partners on the AT&T Learning Network, teaming him up with classes across the country and around the world. For our Learning Circle Project, J. Bear was sent to "live" with each of our Circle Partners. He was accompanied by a video my students had made about their school and their community. Using the AT&T Learning Network, J. Bear telecommunicated back to the students his experiences on his journeys. This Junior Ambassador, this little bear, became a vehicle through which Circle Partners could share experiences and feelings, and discover their shared values. Having distant classes write J. Bear's letters "home" helped all of the students in our Learning Circle see life through each other's eyes. In this way, this inanimate creature promoted collaboration and interaction with students from diverse backgrounds and cultures.

Our Junior Ambassador has sparked a "global" interest in our community, involving not only the parents but also people throughout the community. "Where in the world is J. Bear?" was a question often heard, not only from the children but also from the adults, some of whom had never traveled across the county line!

Each time J. Bear returned from his travels, my students used the telecommunicated "diaries," postcards, and souvenirs to make Big Books and multimedia presentations. Later, these student presentations would become teaching tools for others to use. These student products will be available for participants to review at my presentation.

Using J. Bear as our Junior Ambassador and giving our students access to the world through telecommunications has personalized their studies, bridging the connection to distant places and people, and promoting respect for their own heritage as well as respect and appreciation for other cultures.

Demonstration

Real-Time Learning: The World at Your Doorstep

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Key words: real-time learning, global access

Abstract

Telecommunications has brought the world to the doorstep of every classroom. Its advent signals an opportunity to move our classes from the realm of secondhand and outdated information to that of real-time learning. As the world races toward real-time interaction in every field from economics to science, real-time learning enables students to experience immediate contact with the world. This interaction will become an intimate part of their adult lives.

Classrooms now can carry on projects that interact with the world on an immediate Real-time basis. Students can actually reach out and touch the world. These real-time projects span all academic areas:

1. *Kids WeatherNet—A global sharing of weather information among schools around the world. This project includes weather data collection, satellite images, and weather stations. (This project was created by the presenter).*

2. *Sharing multimedia through Internet.*

3. *Research projects using real-time information via Internet.*

4. *Bilingual projects: Students sharing English and Spanish projects via the Internet. In an era of spiraling technology costs for education, telecommunications projects require very affordable hardware and software.*

State Networks

Development of a Statewide Telecommunications-Based Instructional Delivery System

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Key words: telecommunications, distance education

Abstract

Off-campus instruction activities of Illinois baccalaureate institutions served approximately 13,000 full-time equivalent students in academic year 1990. This does not include the many noncredit and public service activities that these institutions engage in annually, or the numerous off-campus services provided by community colleges. Typically, off-campus courses and services entail a faculty or staff member traveling to the off-campus location. This method of delivery is costly, requiring travel, lodging, and per diem expenditures, and incurs productivity losses by virtue of faculty time spent in travel. Just as telephones reduced time and distance barriers of oral communications and revolutionized the ways in which individuals communicate, telecommunications-based instructional delivery technologies increase the amount and type of information that can be sent across distances and offer opportunities to deliver instruction to remote areas.

Based upon budget requests from the Illinois Board of Higher Education and the Illinois Community College Board, the Illinois General Assembly appropriated $15 million for Fiscal 1994 for the development and expansion of regional telecommunications-based delivery systems. Grant proposals from regional consortia were submitted in May 1993 and awards were made in October to ten consortia. Priority was given to proposals that:

- *provided for new or expanded systems that presented viable plans for serving a wide audience (i.e., extension sites, schools, businesses, government agencies) and that demonstrated the involvement and commitment of the target clientele*
- *were most cost-effective; that is, they presented a plan for initial capital and operating expenditures, as well as recurring costs of operation, that served the target population in an optimal way*
- *showed a plan for an effective integration of telecommunications components, including sound, video, computer-based networking, and imaging*
- *demonstrated both short-term and long-term payoff in the services delivered as a result of the investment in the proposed telecommunications-based instructional delivery system*
- *reflected a plan for effectively utilizing faculty in the delivery of programs through telecommunications technologies and demonstrated faculty involvement in the planning process*
- *were endorsed by regional consortia as addressing the most important needs in a given area of the state*

In addition to these priorities, institutions and consortia were required to identify matching commitments for the proposed system from institutional, private, federal, state, and local sources. For each of the initial consortium grants, matching funds of a comparable amount have been committed for the development of the system. Each consortium was also required to submit a five-year plan describing program priorities, telecommunications sites, interconnections amongst regional consortia, resource requirements, and faculty development activities to support the development of a statewide telecommunications-based instructional delivery system.

This session will present a status report on the development of a telecommunications-based instructional delivery system for the State of Illinois. Information regarding the allotment of a second $15 million for Fiscal 1995 will be included. Topics addressed will cover types of technologies employed, number and placement of sites, range of applications, technical standards guidelines, and planning initiatives for the future.

Project
Scaffolding for Teachers Using Computers: Staff Development Project in Telecommunications

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Key words: telecommunications, staff development, teaching technology, computer inservice

Abstract

The Team Project provides an opportunity for collaboration in staff development in computer technology between Appalachian State University and seven county school systems in northwestern North Carolina. The first phase of the project focused on telecommunications. Four to five hours of staff development supported by a help desk reached by telephone or computer and a notes conference provided a forum for current issues and calls for collaboration.

Team Project at Appalachian State University provides staff development in computer technology to teachers in the seven counties constituting the ASU/Public School Partnership. The project's goal is to support teachers in their planning and implementing of the state computer competencies on which eighth graders across the state will be tested for the first time in spring 1996.

The project is funded for two years by the North Carolina State Legislature. During the first six months of funding (July through December, 1993), planning meetings attended by university representatives, school-system-level technology coordinators in the seven counties, and the seven superintendents of schools lay the groundwork for the formation of a partnership staff development plan. The technology coordinators contacted media/technology coordinators in each school, and together they inventoried computer hardware, software, and the use of this technology by each individual teacher within the schools in their school district. The technology coordinators then met with a planning team from the university, and together they devised a design to meet the specific needs of each county's teachers. The grant provided sufficient funding to reimburse each county for its expenditures for paying substitutes for the teachers taking part in the staff development or for stipends for teachers attending the staff development during hours beyond the school day.

At the beginning of the second six months, a coordinator for the project was hired and an implementation Team was selected. This team is composed of university faculty, graduate students, and two advanced undergraduate students. The team acts as a think tank, with each member having a separate specialty but sharing the decision-making and the actual leading of the staff development activities with the participants.

Design

The team targeted the three most difficult of the nine strands emphasized in the state computer curriculum. Telecommunications was the emphasis for spring 1994. Databases are the focus for fall 1994, and spreadsheets will be the focus for spring1995. The information reported by the county technology coordinators revealed that the word processing strand was not needed as a target area.

Each school system was offered four days of staff development in telecommunications. These four days allowed each teacher in grades 4-8 in selected site schools as well as selected computer teachers and media coordinators from other schools in the district to receive from four to five hours of instruction. The staff development was structured in two parts. The first part involved group activities, while the second part offered individual instruction. The initial contact with teachers was during a three-to-four hour session. During that time the team laid a conceptual foundation for telecommunications by using two types of simulations of electronic mailboxes and electronic bulletin boards. One group of simulations involved hands-on use of computers while the other simulations demonstrated the same concept without actually using computers. In addition, the teachers collaboratively "built" a computer by choosing cardboard boxes to represent each part and "wiring" them together with yarn. Finally, the team facilitated a roundtable discussion on the feasibility of the teachers' integrating telecommunications within their existing curriculum. During a second contact, which was approximately an hour for each teacher, the team provided individualized instruction for logging on to the mainframe computer at Appalachian State. During that hour, teachers sent and received messages via e-mail and explored Gopher and news.

Additional Support

The team provides additional support for the teachers by offering a help desk at the university, which is active from 9:00 a.m. to 3:00 p.m. each school day. A team member is available during those hours to receive telephone calls and e-mail messages. A toll-free number is also available for teachers to use for questions or reports of progress in using telecommunications. In addition, team members are available to go to the school and work directly with an individual teacher or group of teachers as they begin to add telecommunications into their curriculum.

Results

After one semester, team Project has assisted more than 400 teachers and technology coordinators as they begin to use the modems and computers in their own schools. The help desk receives between five and ten messages each day. A notes conference has been set up for an open forum of current issues and for calls for collaboration. Networking has provided professional support for teachers. Also, authentic teaching and learning is taking place for children who are finding an on-line connection within their school to their county, state, country, and world.

There has been an overwhelmingly positive response to the staff development. Teachers contact the team daily asking for curriculum information, names of other teachers who might want to do collaborative planning, and information about how to use the Internet more creatively. The teachers' feedback about the staff development has underscored the importance of a relaxed, fun-filled presentation and daily support as vital to their making telecommunications an integral part of their curriculum.

The success of Team Project is attributed to collaborative planning among the individual teachers, school representatives, county technology coordinators and administrators, and the university team. From the content of the staff development, to the choice of site, to the design of delivery, joint decision-making has been the guiding principle. The teachers' acceptance of using telecommunications more readily than they would have before the staff development is attributed to their working on the platform they would actually use in their teaching at their own school rather than on another platform at a central location. Also, the support offered by both the help desk and visiting technology facilitators from the team have contributed to teachers' readiness to expand their use of telecommunications in their lesson plans as well as to participate in on-line collaboration with other teachers in the seven-county area in North Carolina and beyond.

Policy
How to Develop K-12 Networking Models

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Key words: K-12, telecommunications, networking, Internet, systemic reform, planning, research

Abstract

To develop coherent strategies for designing and implementing large-scale networking models for K-12 education, we are conducting a three-phase assessment, funded by the Department of Energy, over an 18-month period. This effort will include a comprehensive observational field study, beginning in January 1995, of successful K-12 network models across the United States.

At our Tel•Ed presentation, we will describe our findings from a modified field study of nine school districts. We will also review our research methodologies and share preliminary templates and instruments used for conducting site visits and crafting case studies. We will also discuss how we hypothesize that seven key factors related to networking technologies contribute to systemic reform of K-12 education. We believe that these factors can be used to develop a set of tools that will assist districts in designing, implementing, and evaluating networks. These

tools will guide federal agencies in making decisions about how best to fund K-12 networking initiatives. Tools will include a networking technology template, which will detail best practices in K-12 networking technology environments; a flowchart, which will guide districts through a series of questions and decisions related to networking; and an on-line multimedia database of network models across the country, which will be accessible to educators around the world.

Policy
Managing Electronic Information Resources: Processes and Issues

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Key words: telecommunications, electronic forums, information management, technology policy

Abstract

The presentation will focus on the processes and issues connected with managing large electronic forums and should interest all information specialists regardless of subject matter. The OTAN On-line Forum, which began in 1990, includes calendar, notice, directory, program management, and curricular information for adult educators. An on-line demonstration will be given. Presenters will suggest forum management and policy issue concerns, and participants will have an opportunity to brainstorm solutions and initiate contacts for future networking. A listserv on the Internet to facilitate continued sharing by participants is a possible result of the session.

OTAN, An Example of an Electronic Forum

The Outreach and Technical Assistance Network (OTAN) is federally funded through the California Department of Education, Adult Education Unit, to provide technical assistance, communications linkages, and information to adult education providers. The communications component, known as the OTAN On-line Communication System, began in 1990 as a computer-based pathway for electronic mail, coupled with an electronic information service providing access to current and historic adult education resources.

The OTAN On-line Forum provides a wide range of resources and information to assist adult educators in making better decisions in managing their classrooms and agencies. The information is divided into 17 areas, which are further subdivided into folders covering the area's major topics. Included are calendar, notice, directory, program management, and curricular information.

OTAN On-line is available on CONNECT, Inc., which features an easy-to-use graphic interface for both Macintosh and IBM/IBM-compatible Windows users. OTAN On-line is also published via a Gopher server on the Internet. An on-line demonstration of the OTAN On-line Forum highlighting organizational features will be included in the presentation.

This project presentation will focus on the processes and issues connected with managing a large electronic forum and should be of interest to information specialists regardless of subject matter.

Processes in Managing an Electronic Forum

The process part of the presentation will include: assessing user needs, networking for information acquisition, preparing data for posting on-line, developing effective on-line structure, keeping information up to date, searching the data, and evaluating and modifying the structure. Presenters will suggest forum management concerns, and participants will have an opportunity to brainstorm solutions and initiate contacts for future networking.

Assessment of user needs is an ever-present concern to forum managers. Discussion will include start-up needs assessments for individual forums, periodic polling of subscribers, and as state and national infrastructure needs.

Processes for preparing data for posting on-line are constantly changing with the technology. Discussion will focus on preparing data received in print or electronic versions and methods of formatting and dividing data for on-line use.

Developing an effective on-line structure depends on both the user needs and the content itself. Customizing structures to make data accessible to users will be discussed.

While acquiring current information is a significant concern in electronic forums, there is also a role for archival data and long-term electronic storage.

A variety of methods for searching on-line forums and databases will be mentioned, including keyword controlled vocabulary and structure searches.

Policy Issues Related to Electronic Forums

The issues part of the presentation may include the role of specialized forums in the national electronic highway, the role of federal agencies in distributing electronic information, and problems in training users to access information electronically.

Thousands of specialized forums already exist on the national electronic highway. What is the ideal size of a forum in terms of numbers of users? What factors, such as expertise of users and level of support provided, influence the answer? How many forums are too many in a particular subject, such as aoult literacy, where forums are proliferating in the face of shrinking resources, with little federal direction?

What is the role of federal agencies? Who should be generating information, and how, and to whom should it be made available electronically? Is there such a thing as a free forum? Who should pay, the user or the taxpayer?

What is the obligation of forum managers to train users? Should the forums get involved in recommending hardware and software, in troubleshooting hardware? What is happening at school sites regarding technical support?

Participants may raise additional issues, and a dialogue will begin, which will possibly continue on a new listserv if enough interest is generated.

International Project
Shrinking the World While Expanding Horizons: Telecommunications in the Virgin Islands

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Key words: telecommunications, global education, GlobalSCHLnet

Abstract

Telecommunications provides an effective and inexpensive means of enhancing the educational horizons of students in geographically isolated areas. Using FrEdMail-GlobalSCHLnet, AT&T's Learning Network, National Geographic's Kids Net, and other educational communication highways, students in the Virgin Islands have collaborated with peers from around the world on a number of projects.

The presentation gives a view of what it takes to provide this powerful tool to students, what they have accomplished using telecommunications as a motivating medium, and what future plans are for telecommunications in the Virgin Islands.

Panel
Telecommunications and Teacher Education

Karin Wiburg
New Mexico State University

Priscilla Norton
University of New Mexico

Terry Boulanger
New Mexico TechNet
Betsy Fredrick
Albuquerque Public Schools

Pam Tipton
Roswell Public Schools

Tomas Salazar
New Mexico Highlands University

Abstract

Models for use of telecommunications in preservice, inservice, and graduate teacher education; issues involving access, professional development, and teacher communication from a variety of perspectives presented by representatives from private industry, the public schools, and the university.

Demonstration
NASA Spacelink. . .NASA's Educational Link to the Information Highway

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Key words: NASA, Spacelink, Internet, curriculum, electronic database, demonstration

Abstract

Would your students like to "talk" via classroom computer to an astronaut? Are you interested in integrating space-related units of study into the curriculum? Would you like to show your students the latest images from the Hubble Space Telescope? NASA Spacelink allows you to bring the world of space and aeronautics into your classroom via computer, modem, and

telephone line or Internet connection. Participants will be introduced to the opportunities and information available via the new and enhanced NASA Spacelink, the agency's electronic educational database.

NASA Spacelink offers a wide range of materials related to the space program. Information is available in several forms, ranging from computer text files to software and graphics. Its target audience is teachers, faculty, and students. The system is intended to help educators reach the national education goals that are outlined by individual states and the federal government. NASA representatives will demonstrate the system and answer questions about how you and your students can communicate with NASA. Other NASA databases that can be accessed via the Internet will also be addressed.

Hardware/Network Issues

Creating a Wide Area Network: A Case Study of C.F.B.I.S.D.

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Key words: Wide Area Network, implementation, instructional system, case study

Abstract

A comprehensive wide area network can have a significant, yet positive, impact on your school district. Like anything else in education, if it doesn't have the support of the public, the school board, teachers, and administration, it is doomed to failure. However, if everyone is supportive of the project, the benefits will far outweigh the actual costs. Numerous school districts are just now in a position to take advantage of this new technology. With that in mind, read on to learn the process that Carrollton Farmers-Branch ISD. went through to create its network.

In our district, we prefer to call our wide area network an instructional support system. By using a twelve-step process, we were able to implement a comprehensive plan that guarantees success.

Needs Assessment

The first step in this journey is to complete a "Needs Assessment" to determine what your district wants to accomplish with an **instructional support system**. The assessment's goal should be a long-range plan that can take your district into the next century and still be compatible with technological advancements. Our assessment's objective was to obtain feedback from all areas of the school district. Our district wanted every employee to have a say in what our network should be capable of doing in both an instructional and an administrative environment.

Select Software

During the analysis, there were numerous considerations with regard to selecting software. Our district focused on four major areas. Does it match our "Needs Assessment"? How much is it going to cost? Will it be networkable with our system? Will it be compatible with our system? In other words, if a document is saved on the DOS side, will be possible to access it on the Macintosh side?

Request for Proposal

The second step was to release a document called an "RFP." Basically, it stated what our district wanted to accomplish with our network and asked how could the vendor help achieve this goal. The **RFP** was mailed to numerous vendors/bidders and anyone who requested a copy. Only the goals were specified, not how they should be accomplished. The companies that were interested used their expertise to design our instructional support system.

After careful consideration, our committee selected and recommended a company that best fulfilled our needs, stayed within our suggested budget, and covered all aspects of the RFP. Digital Equipment Corporation was the clear winner, and a better decision could not have been made. Digital has lived up to every expectation, and our network has performed flawlessly.

Select Hardware

The kind of hardware to use was also an important consideration. Does the equipment cover our needs? What kind of file server will be needed? Can it handle all of the software applications? Will there be a need for more than one fileserver? The cost had to be considered, but response time and redundancy also had to be taken into account. It was also important to determine the load (number of users, how much data would be going across the network, and how much memory would be required) on the equipment and network.

And, then there are the workstations. What kind of monitors will be used? Is there enough memory on each individual computer to handle the network and the applications at the same time? Can the computer handle multimedia packages? Our district continually referred to our "Needs Assessment" and the specifications established by the vendor.

Management Capabilities

Another serious consideration was our ability to manage the network. Our committee reviewed the proposed application tools that would facilitate the management of the hardware, software, and servers. With our limited resources, our number one goal was to keep human resources to a minimum. Digital proposed one network manager with the proper tools to maintain the network, a formidable task since there are 28 campuses and two administration buildings. Our network manager has total control over all 25 servers and he does an outstanding job of keeping our network alive and functional.

Installation of the Network

In the RFP, there will be a section for planning the physical aspects of the network, including a network map. Each building will need a map as a guide showing where to lay down the wiring inside each complex, along with outlets in each room to connect to the network. At this juncture, your district, along with your vendor, will need to decide what devices will be required as relay junctions. Will it be a router or a repeater? How many will be needed? What will be used as the backbone for the network? What will be the power source? What are the expenses? These are items that need to be considered during this planning phase.

The Bidding Process

As we all know, the bidding process can be a complicated minefield which has given administrators severe headaches, especially when dealing with the purchase of a massive project of this nature. Hopefully, these obstacles can be avoided by following some basic guidelines that will keep the line of communication open between your district and the vendors.

In the RFP, the evaluation process must be fully explained. Include a comprehensive (specifications worksheet) that leaves nothing unsaid. Of course, make sure that state guidelines are followed. Give the vendors sufficient time to respond to your RFP. Bid conferences were held to allow the vendors a chance to sit down and talk with us one-on-one. This process alleviated miscommunication.

The Contract

A contract is defined as a promise for the breach of which the law gives a remedy, or for the performance of which the law recognizes a duty. It is a written summary of the previously identified components of the RFP that has been discussed and agreed upon by both your district and the vendor. Obviously, both sides will be represented by lawyers, and this is best, considering the amount of money involved. Your district should be prepared for exhaustive negotiations between attorneys, which can take months to complete.

Implementation of the Network

Now that the bid has been accepted and the contract has been completed, it is time to install your network! Again, it is important to have a collaborative agreement on how to judge when the installation is completed. The warranty and service agreement will keep this process alive for at least a year, if not longer, depending on the length of these aspects of your contract. Another consideration is how parts will be ordered and delivered.

Utilizing the Network

Now that the network is accessible, it is time to get the word out! Without users a network is basically worthless. People (administrators and teachers alike) have a natural tendency to avoid trying new and emerging technology. It will be up to your district to support and train your staff. In our district, we hired a trainer to instruct our personnel, and we also have on-line two help desk positions so that the users can call anytime they have a problem. Without this kind of support and training, it will take a long time for your district to take advantage of all of the wonderful tools and applications that a network can provide in both the administrative business segment and the instructional environment.

Planning Maintenance of the Network

How will your district keep your network up and running once the warranties and service agreement have run their course? It is inevitable that computers will break down. Without a warranty, this can be a costly endeavor. Most vendors will provide repair maintenance for your hardware. However, it is wise to look at other avenues or options. An outside contractor can be retained to mend or rebuild the computers. Our in-district mail system is used to pick up and deliver hardware devices to our Computer Service Center. Most minor repairs are done by the district's staff; the rest are sent to an outside contractor.

Plan for Continual Evaluation of the Network

One thing is for certain: new technology will be faster, more comprehensive, and, in general, better than what is being purchased today. It is the nature of the business and without proper planning it can leave your district out of the real-world loop in just a few short years. How your district approaches this dilemma will determine the long-term success or failure of your network. Our district believes emerging technology can help improve the overall performance of our network. This belief makes our staff's job much easier and gives them tools that were not previously available.

State Networks
The World at Our Fingertips

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Key words: telecommunications project, cultural exchanges, student involvement

Abstract

We are truly living in a "global society." In order to teach students more about the world and its people, for the past two years students in microcomputer applications classes at Burleson High School in Burleson, Texas, have worked on telecommunications projects using TENET, the Texas Education Network, that have enabled them to have the "world at their fingertips." Students communicated with other students in many foreign countries. Working in cooperative learning groups, each student group wrote messages "off-line" and then "uploaded" them to their "keypals." Topics of discussions were AIDS, education, politics, cultural events, religion, traditions, music, literature, sports, drug use, etc.

Students also prepared a research paper about their "adopted" country, using a variety of resources, including CD-ROM disks. Students wrote the travel boards of their country and requested data. A package containing pictures of the student group, school newspapers, postcards with scenes from Texas, a brochure about our city, etc. was mailed to keypals. In return, my students received packages from all over the world containing similar items. Oral presentations were made by the student groups to their classmates detailing interesting facts about their country. Native foods, items from the country, posters, music, pictures, etc., added to the students' presentations. The presentations were videotaped and shared with all the other classes. After this project, students fully realized that the "world is at their fingertips."

Information about a video from NASA that explains the Internet will be shared with the attendees, as well as suggestions on how to introduce telecommunications and the Internet to a class. Practical teaching tips will be shared. Handouts will include sample letters from students all over the world and copies of some of the transparencies used in the classroom. Many examples of student interaction, as well as of cross-curricular activities, will be given.

Paper

A Systems Approach to Evaluating Distance Education

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Key words: evaluation, systems

Distance Education and Evaluation

Distance education is an innovation that has enjoyed widespread acceptance and application in the past several years. Systems that were just recently on the drawing board are up and running; many are an accepted part of the education or training environment. It is this transition from novelty to normalcy that should signal the initiation of a standard program evaluation procedure. The extremes of positive and negative reactions that often greet innovations begin to regress toward the mean and calls for program accountability are heard. Program directors and coordinators may also realize that evaluation can serve a positive function in maintaining and improving the service offered by a distance delivery system.

Evaluation may, however, connote a process of "looking for trouble" for many. Negative metaphors, unfortunately, do not lend themselves to utilizing evaluation results for positive ends, and, more often than not, we find what we're looking for. With this perception, it shouldn't be surprising if evaluation is put off too long, for fear of what might be found. If, instead, evaluators adopt a "wellness" metaphor, "checking up" on a distance education program need be no more threatening than a routine physical examination. And, continuing this analogy, if we use a systems approach to evaluation (remembering that the human body is a marvelously complex system), the evaluation process can provide a "big picture" view of the health and vitality of the program.

Systems theory, as one of the foundational elements of the field of educational technology, offers guidance in the design and development of many alternative instructional delivery modes (Association for Educational Communications and Technology, 1994). If we assume that distance education programs are, in fact, systems, then it follows that this theoretical perspective can also direct our efforts in conducting evaluations. This article offers an approach, based on systems theory, to planning and implementing evaluations that will provide a comprehensive picture of the health of a distance education program. No new "magic model" will be proposed; instead, a rationale for choosing among existing evaluation models will be offered to guide the evaluator in creating a workable procedure that produces meaningful results.

Evaluation Models

Several types of models have been used successfully to guide program evaluation. Popham (1988) identified five categories of models used for educational evaluation: goal-attainment, judgmental emphasizing input, judgmental emphasizing output, decision-facilitation, and naturalistic. Each of these types is useful and could be beneficial to the distance education evaluator.

Goal-attainment models that examine whether predetermined outcomes have been reached are intuitively attractive ("Did we get where we wanted to go?") and perhaps the easiest to implement. In a distance education program, pre-specified desired outcomes (e.g., number of students enrolled or courses offered) are simply matched against the actual results to determine the level of success realized.

Judgmental models that emphasize inputs or outputs examine the characteristics of the program itself, such as the quality of the materials, the qualifications of key personnel, or the appropriateness of the original goals. This type of evaluation model, based on the use of expert judgment, facilitates the identification of unanticipated effects, as well, as opposed to the narrower focus of goal-attainment models. Distance education evaluators may judge the quality of a program's course offerings by gathering data related to opportunities for student interaction, instructor expertise, comprehensibility of visuals, or other course characteristics.

Decision-facilitation models are typically used to identify and gather information for accountability or credibility purposes. Someone other than the evaluator, typically, will use the data to judge the worth of a program. Using this type of model to assess the merit of a distance education program would provide evidence to those with authority when decisions regarding program continuation or funding, for example, are faced.

Models that impose few constraints on the evaluation itself are often labeled naturalistic or qualitative. These models are used to guide, albeit in an unstructured manner, an evaluation process during which information is gathered in an authentic context. The distance education evaluator may use this type of approach when he or she decides to examine videotapes of classes or to gather evidence during classes as a participant-observer to draw conclusions about patterns of student-student interactions or teacher-student interactions.

Popham's taxonomy is not the only means of categorizing models (see, for example, Worthen & Sanders, 1987, or House, 1980), but it offers a helpful structure to the distance education evaluator. Using these categories as a collection of tools from which to select, the evaluator can then create a customized procedure based on a holistic systems approach.

Systems Theory and Evaluation

Systems theory, applied to education. offers a foundation for research, design, and development efforts and provides a "big picture" view of the instructional program. Banathy's early treatise on systems theory applied to education, Instructional Systems (1968), offered a straightforward view of what constitutes a system and how a system should function. Using this simple explanation, an evaluator can determine what, specifically, he or she is judging and what types of information are necessary for this process. The three components of a system as identified by Banathy include the purpose(s) of a system, its processes, and its content. Each of these components may be evaluated separately or in combination with one or both of the other components.

Purposes

The purposes of a system are synonymous with the system's goals—why does this system exist? Apart from the obvious question "What are the goals of this system?" other issues that may arise relative to the purpose include, "How were the goals arrived at?" and "Are these goals appropriate?" For the distance education program evaluator, questions emphasizing purpose may signal a formative approach, implying that the object of the evaluation study is in development or, like courseware, is never considered truly "finished" and therefore requires continuous evaluation.

Decision-facilitation models may be an appropriate choice. Those evaluating a distance education program with this emphasis could consider adapting the structure offered by Stufflebeam and Guba's CIPP Model (1971). Needs assessment and analysis data, gathered using the "C" (for Context) procedures will be most helpful in aligning the goals/purposes with the actual needs the system is to address. Although goal-attainment models are typically used to compare final outcomes to goals, Sanders and Cunningham (1974) suggested several methods for "screening " goals before using them as the basis for evaluation. The evaluator may also choose to project forward and extrapolate outcomes in order to identify any potential mismatches before the program is implemented.

Processes

The processes of a system are its functions, the actions that take place to move the system toward its purpose. When examining processes, evaluators will look at what is happening as well as at what should be happening. How well specific functions are being performed and the relationships among various functions will also be documented. Outcomes (anticipated and otherwise) offer evidence related to the quality of a system's processes.

For this type of evaluation, goal-attainment models are useful, as are judgmental models focusing on outputs, and naturalistic models that include authentic assessment of system activities. Goal-attainment models, such as Hammond's "cube" structure (1973), focus attention on specific factors that influence the success or failure of a system. In contrast, Scriven's "goal-free" approach (1972) is a judgmental method that allows the results of a program to be "discovered" by experts in that domain, even if the accomplishments were not what was originally expected. Naturalistic models that utilize "real-life" contexts for gathering information (extensive observations of student/teacher or student/student interactions, for example) will allow an evaluator to collect data reflecting actual events as examples (good or bad) of system processes.

The work of LeCompte and Goetz (1982) on the techniques of ethnographic research or the example of Morgan (1991) on using a case-study approach in evaluating distance education offers evaluators guidance in creating a rich and useful description of the program under investigation.

Content

The content of a system can be thought of as the inputs, or resources, that are available and necessary for the processes to occur. These resources might include money, people, materials, facilities, time, or anything else required for the system to operate. This system component is one of the more quantifiable aspects of a distance education evaluation. What resources are needed? How many are already available? Are they of suitable quality? Where might additional resources be obtained? These questions, and similar ones, would be answered when evaluating the content of a system.

Probably the most familiar judgmental model, for many educators, is that used for institutional accreditation. This type of model, utilizing expert judgment and emphasizing inputs, requires that programs identify and delineate aspects of predetermined "intrinsic criteria." These criteria are factors related to the program itself (e.g., number of students, qualifications of faculty members, or quality of instructional materials), as opposed to the effects of the program's operations. Decision-facilitation models, such as the CIPP described earlier, may also be of value in examining the content and locating resources necessary for the functions to move the system toward its purposes.

Creating a Customized Evaluation Approach

In using a systems approach to design an evaluation plan, a program evaluator initially determines whether a comprehensive picture is required (of purposes-processes-content) or whether only one component of the system is to be examined. If a total composite is not called for, a helpful way to think of each of these steps is to ask:

- Am I most concerned with why the system exists and where it is headed?
- Am I most concerned with what needs to happen and how in order to get to the goal?
- Am I most concerned with the resources that are needed to make those things happen?

Answering these questions will focus the evaluation on whatever area (or areas) is most crucial. Then, beginning with the suggestions offered above, the evaluator selects a model or models that will provide reliable and sufficient data. If more than one of the models seems suitable, Thorpe (1988) suggests that: "there is no one right model and that . . . a combination of approaches appropriate to the purposes and resources available to us at the time" should be utilized (p 8-9).

Obviously, each evaluator must consider the resources available for conducting an evaluation. Priorities determined by how the data will be used, who will use it, how quickly they need it, and in what form it is to be presented will guide the evaluator as well.

Summary

This article proposed an approach to evaluating distance education programs that utilizes a systems view and encourages the use of existing models. A "wellness" metaphor was suggested to counteract the negative aspects of evaluation that may create obstacles to rigorous study of a program's operations. Banathy's (1968) description of the three components of all systems (purposes, processes, and content) underscores the structure of this approach and provides a comprehensive framework from which to design a customized evaluation plan. Evaluation (as opposed to research) has, in the past, been labeled as an activity that "does not require any systematic procedures . . . or objective evidence . . . to support judgments" (Suchman, 1967, p. 7). If this is so, what would a skeptic of alternative instructional delivery methods think of the results of an evaluation of a particular distance education program? If generally accepted models employing "systematic procedures" are not used, the credibility of the results is at stake. Unfortunately, in a field like distance education, that is perceived by many to be new and untested, the credibility of more than just one program may be damaged. Practitioners in the field of distance education must themselves demand that programs be critiqued with the jaundiced eye of a nonbeliever. By adopting positive metaphors for evaluation (e.g., wellness), basing evaluation plans on solid theoretical foundations (e.g., systems theory), and choosing to apply data collection techniques accepted by the scholarly community (e.g., those described above), the evaluators can enhance the credibility of an evaluation design. It is this self-policing aspect that will prod distance education toward greater maturity and growth as an area of academic inquiry. It will, ultimately, be reflected in greater educational opportunity for the customer—students.

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REMOTE/DISTANCE EDUCATION

SOCIAL STUDIES

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